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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 14, NUMBER 22
NOVEMBER 15, 1981

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A semimonthly publication of the Office of Water Research and Technology,
U.S. Department of the Interior

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The Secretary of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most our our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several services of the Office of Water Research and Technology. The cumlative SWRA file from 1968 and monthly updates are available also in magnetic tape through lease from NTIS.

THE OFFICE OF WATER RESEARCH AND TECHNOLOGY DOES NOT PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION

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04 WATER QUANTITY MANAGEMENT AND CONTROL

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05 WATER QUALITY MANAGEMENT AND PROTECTION

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07 RESOURCES DATA

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

OVERLAND FLOW FROM TIME-DISTRIBUTED RAINFALL,
Science and Education Administration, Columbia, MO. North Central Watershed Research Center.
A. T. Hjelmfelt Jr.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107. No HY2, p 227-238, February, 1981. 5 Fig, 15 Ref.

Descriptors: *Rainfall-runoff relationships, *Runoff, *Overland flow, Hydrology, Peak Discharge, Mathematical studies, Storms, Watersheds.

The influence of time distribution of rainfall on peak discharge was determined. Contrary to the usual design procedures which use rainfall of constant intensity for a duration equal to the time to equilibrium, this analysis indicates that the peak discharge at the design condition will be slightly greater for rainfall of constant intensity than for rainfall with a thunderstorm time distribution. Difficulty in estimating this time parameter limits any value in considering the time distribution of rainfall in design application. The constant intensity approximation applies to rainfall durations equal to the time to equilibrium or less. However, as the relative duration increases, the approximation becomes less valid. Therefore, underdesign can result from errors in the value for time to equilibrium. (Cassar-FRC)
W81-05470

DISSOLVED OXYGEN IN STREAMS AND RESERVOIRS,
Tennessee Valley Authority, Chattanooga.
B. R. Kim, and R. J. Ruane.
Journal of the Water Pollution Control Federation (Literature Review Issue), Vol 52, No 6, p 1519-1528, June, 1980. 93 Ref.

Descriptors: *Dissolved oxygen, *Oxygen, *Streams, *Reservoirs, Monitoring, *Water quality, Literature review, Runoff, Surface runoff, Water pollution, Nutrients, *Model studies, Rivers, Biological oxygen demand, Chemical oxygen demand, Nitrification, Photosynthesis.

A review of recent literature on dissolved oxygen in streams focuses on general subjects, water quality models, oxygen demand, and oxygen transfer. General subjects include standards for streams in general and for specific geographical locations; design and comparison of sampling and monitoring methods; pollution from surface runoff; water quality in specified streams and reservoirs; responses of lakes and streams to waste, nutrients, and hydraulic loading; and improvement in water quality in specific lakes as a result of reducing waste loads. Many water quality models have been derived: runoff models, river models, reservoir models, and planning models. Oxygen demand studies included investigations of nitrification, effects of photosynthesis on dissolved oxygen, and measurement of biological oxygen demand and dissolved oxygen. Oxygen transfer study projects included a measurement of stream reaeration coefficients using a hydrocarbon tracer and a conservative tracer. The investigation of destratification processes using air injection at the bottom of a thermally stratified lake or reservoir indicated the importance of the number of injection points used. Laboratory studies concerned the aeration efficiency of a diffuser, and indicated that efficiency increased with increasing cross flow velocity and describing air rate. Most channel dams and weirs in northern Illinois streams were found to affect dissolved oxygen, a fact which should be taken into account in water quality models. (Cassar-FRC)
W81-05558

THE ENRICHMENT OF SOIL PHOSPHORUS IN RUNOFF SEDIMENTS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W81-05561

STORMWATER POLLUTANT LOAD-RUNOFF RELATIONSHIPS,
Rice Univ., Houston, TX.
P. B. Bedient, J. L. Lambert, and N. K. Springer.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2396-2404, September, 1980. 5 Fig, 6 Tab, 17 Ref.

Descriptors: Runoff, *Urban runoff, *Rainfall-runoff relationships, *Storm runoff, *Storm wastewater, Pollutants, Model studies, Path of pollutants, Cities, Hydrographs, Water pollution sources, Houston, Texas, Mathematical models.

Results from a comprehensive storm water monitoring program at four sites in Houston, Texas, show correlations between total storm loads and total runoff volume between peak loads and peak streamflows. Contrary to previous studies of other urban watersheds, no significant correlation was found between antecedent days without rainfall and observed concentrations or total loads, probably because of the residential character and mild slopes in the region. Total storm loads were predicted using known hydrographs and the exponential washoff equation. Important parameters are the initial concentration, exponential decay constant, and peak load vs. peak runoff relation. Sampling frequency depends on the size and hydrologic response of the watershed. A fully developed site should be sampled every 15-30 min on the rise of the hydrograph and less on the recession. Larger watersheds can be sampled every half hour to 1 hour on the rise. (Cassar-FRC)
W81-05574

2E. Streamflow and Runoff

STREAM-TEMPERATURE PATTERNS OF THE MUDDY CREEK BASIN, ANNE ARUNDEL COUNTY, MARYLAND,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05394

POTENTIAL HAZARDS FROM FLOODFLOWS IN WILDROSE CANYON, DEATH VALLEY NATIONAL MONUMENT, CALIFORNIA AND NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. R. Crippen.
Available from OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $4.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-407, June, 1981. 23 p, 18 Fig, 4 Tab, 6 Ref.

Descriptors: *Flood flow, Cloudbursts, *Flash floods, *Hazards, Flood damage, Canyons, Mountains, Flood peak, Flood discharge, *California, *Nevada, Death Valley National Monument, Wildrose Canyon, Panamint Mountains.

Wildrose Canyon, in the western slopes of the Panamint Mountains, is a well-traveled route in Death Valley National Monument and is a scenic area often visited for its own sake. It is an arid region that is subject to flash flooding. Although such flooding is infrequent, when it occurs in the steep, narrow canyon within which the road lies, the flow of water and accompanying debris may be hazardous to life and to any obstacle in its path. Historical records of amounts of rainfall and floodflow in the area are sparse, but data from the basin and from similar areas in the desert mountains of southern California are sufficient to provide a basis for estimates of the degree of hazard. Potential hazards from floodflows are defined for Wildrose Canyon and its nearby approach routes. (USGS)
W81-05403

INVESTIGATION OF THE HURST COEFFICIENT AND OPTIMIZATION OF ARMA MODELS FOR ANNUAL RIVER FLOWS,
Purdue Univ., Layfayette, IN. School of Civil Engineering.
M. Hashino, and J. W. Delleur.
Technical Report No CE-HSE-81-1, January, 1981. 96 p, 12 Fig, 22 Tab, 43 Ref.

Descriptors: *River flow, *Model studies, *Hurst coefficient, Statistical model, Autoregressive moving average, Time series analysis, Mathematical studies.

The sources of high values of the Hurst coefficient found in some hydrologic time series of annual flows is investigated and a search procedure is developed for the optimal autoregressive-moving average (ARMA) model that approximately preserves such values of the Hurst coefficient. A stepwise regressive analysis shows that the Hurst coefficient is greatly influenced by the long dependence structure of the autocorrelation function and of the partial autocorrelation function and by the length of the series, but is not influenced by the coefficients of variation, skewness and kurtosis. Among the 140 time series analyzed, 51 had a significant change in the mean level which is reflected on the structure of the autocorrelation and partial autcorrelation. Eleven series were used in the search for the optimal ARMA model: 4 with mean shift and high Hurst coefficient, 4 without mean shift and high Hurst coefficient, and 3 with low Hurst coefficient and no mean shift. For each of the eight rivers with high Hurst coefficient (with and without mean shift), 3,000 synthetic time series were generated using the better ARMA models, and the probability distribution of the Hurst coefficient was obtained. It was found that the models chosen from the Akaike information criterion and the coefficient of determination preserve the Hurst coefficient, provided that attention is paid to the whiteness and normality of the residuals.
W81-05437

UNCERTAINTIES RESULTING FROM CHANGES IN RIVER FORM,
Geological Survey, Sacramento, CA.
D. E. Burkham.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY5, p 593-610. May, 1981. 4 Fig, 20 Ref.

Descriptors: *River systems, *Channeling, Drainage systems, Sedimentation, Hydraulics, Flood flow, *Alluvial channels, River flow, Drainage patterns, Geology, Channel accretion, Channel morphology.

Hydrological implications and uncertainties are created by temporal changes in alluvial-channel form in relatively large watersheds. Historical evidence of river-form changes is extensive. Hydrologic implications and uncertainties arise in relation to channel-form changes and land use, flood characteristics of alluvial streams, and hydrology and sediment yields for basins in the Southwest. Changes in river form are produced by processes involving long-term geologic influences, annual and seasonal fluctuations in the water and sediment runoff, and artificial influences exerted on the river by man's activities. Rivers in arid and semi-arid regions are more susceptible to major changes in form than those in more humid regions. The capability to determine whether a river is susceptible to such change or when such a change might occur does not exist at present. The origin of change may be local, but usually the causes propagate along alluvium-filled valleys to other parts of the basin. As the laws governing sediment transport are not completely known, an adequate accounting of the timing and discontinuities of processes involved in sedimentation is not possible. Channel-form changes have been related to logging in the uplands of the redwood forest in California, overgrazing in the Southwest, flood routing, frequency of flooding and hydraulics of floods, in-regime concepts, and surface runoff, groundwater recharge and sediment yields. (Baker-FRC)
W81-05479

MATHEMATICAL MODEL OF SHALLOW WATER FLOW OVER POROUS MEDIA,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
A. O. Akan, and B. C. Yen.

Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY4, p 479-494, April, 1981. 11 Fig, 32 Ref.

Descriptors: *Mathematical models, *Flow measurement, *Porous media, Surface flow, Surface runoff, Groundwater runoff, Irrigation design, Surface-groundwater relations.

A conjunctive surface-subsurface flow model was developed for shallow water flow over porous media. Surface flow is described by a set of one-dimensional dynamic wave equations, while subsurface flow is assumed to be two-dimensional, with vertical and surface flow directions. Saturated and unsaturated zones are considered. The model was verified by comparing the numerical results with some existing analytical solutions and limited available experimental results. Several engineering applications for the model are: the amount of surface runoff, interflow, and groundwater flow resulting from a rainstorm; hydraulics of some surface irrigation methods; and the influence of the unsaturated zone on free surface groundwater flow. The flexibility and generality of the model allow quantitative studies in many areas. All components of the system being modelled are in dynamic equilibrium, satisfying the principles of continuity and momentum. (Small-FRC)
W81-05496

THE PROBLEM OF SPATIALLY REPRESENTING LOW STREAMFLOW,
Sussex Univ., Brighton (England).
For primary bibliographic entry see Field 7C.
W81-05513

CONVERGING FLOW MODEL APPLIED TO URBAN CATCHMENT,
CH2M Hill, Reston, VA.
For primary bibliographic entry see Field 4C.
W81-05587

FLOOD PREVENTION IN SIDCUP.
Water Services, Vol 85, No 1020, p 70-71, February, 1981. 2 Fig.

Descriptors: *Flood control, *Sewer systems, *England, Outfalls, Flood protection, Headwater control, *Floodproofing, Flood damage, Floodwater, Water.

An outfall chamber was sunk to an existing low level concrete sewer 16 meters below ground level in efforts to control flooding in a subcatchment near the Halfway Street in Sidcup. The Thames Water Authority would then construct the sewer network at the higher level and under a separate contract. Original studies indicated that the shaft would pass through clayey silt, influenced by a perched water table, an 8 meter layer of stiff clay, a gravel band and a layer of clayey silty sand, within which the existing sewer was constructed. Some form of ground treatment was needed. Eight suggested approaches were offered: three ground freezing solutions, three dewatering solutions, and two compressed air solutions. A compressed air solution was finally adopted as being the most favorable. Major problems to be overcome included stabilizing the gravel layer above the sewer, stabilizing the Thanet sand around the sewer, and effectively sealing the sub-drains which would attract water from a long distance away, perhaps at some considerable head. Strict rules for working under air pressure have been adhered to, and extensive attempts have been made to educate the public concerning the problem and the proposed solution. (Baker-FRC)
W81-05665

FIGHTING THE SURGE,
L. Freeman.
Water, No 36, p 2-7, January, 1981. 1 Fig.

Descriptors: *Tidal floods, *Flood control, *Great Britain, *Thames River, London, Flood protection, Dams, Planning, Tidal waves, Construction costs.

As a result of a flood in 1953 caused by a storm along the coast which wrecked sea defenses, Great Britain is now finishing construction of a mammoth, multi-million pound sterling flood defense system along the eastern coast in general and particularly along the Thames and its tributaries. The defense system is designed to withstand a surge tide with the force of a one in 1,000 year severity. The effect of surge tides could be significantly worse in the future than in the past as a result of the greater volume of sea water due to melting ice caps and to the slow tilting which Britain is experiencing, causing the south-east portion of the island to dip downwards. The Thames Flood Barrier being constructed on the Thames at London is the largest item in the flood defense system. It will span 570 yards bank to bank and will cost over 400 million pounds sterling. The Greater London Council is also constructing 12.5 miles of flood defense walling downstream of the barrier. The Anglian, Thames, and Southern Water Authorities are constructing an additional seven flood barriers on the Thames at a total cost of over 180 million pounds sterling. One additional barrier was already in place. Once a dangerous flood is declared imminent, it should be possible to close all the barriers within 30 minutes. Provisions have been made for close and backup communications among the various water authorities in the event of a flood. The barriers incorporate backup power supply systems and, in some cases, arrangements for emergency manual operation. (Carroll-FRC)
W81-05697

2F. Groundwater

GROUNDWATER RESOURCES OF BILLINGS, GOLDEN VALLEY, AND SLOPE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
L. O. Anna.
North Dakota County Groundwater Studies 29--Part III, and North Dakota Geological Survey Bulletin 76--Part III, 1981. 56 p, 18 Fig, 1 Plate, 6 Tab, 69 Ref.

Descriptors: *Groundwater, *Aquifer characteristics, Transmissivity, *Water yield, *Water quality, Chemical properties, Water supply, *Groundwater availability, Geohydrology, Wells, Data collections, Water level fluctuations, Maps, Water use, *North Dakota, Billings County, Golden Valley County, Slope County.

In Billings, Golden Valley, and Slope Counties, N. Dak., rocks within 2,200 feet of the land surface contain several aquifers that bear relatively fresh water. The aquifers, which are in rocks of Late Cretaceous and Tertiary age, consist of interbedded sandstone, siltstone, claystone, and lignite. The major aquifers in the three-county area are the Fox Hills-lower Hell Creek aquifer system, the upper Hell Creek-lower Ludlow aquifer system, and aquifers in the upper part of the Ludlow, Tongue River, and Sentinel Butte Members of the Fort Union Formation. The Fox Hills-lower Hell Creek aquifer system has a mean transmissivity of 313 feet squared per day and may yield as much as 300 gallons per minute of sodium bicarbonate type water. The other aquifers generally yield less water, but the water is also predominantly a sodium bicarbonate type. Withdrawals of water from flowing wells along the valley of the Little Missouri River have created a cone of depression and major deflection in the potentiometric surface of all the major aquifers. (USGS)
W81-05391

GROUNDWATER DATA FOR MCHENRY COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
P. G. Randich.
North Dakota County Groundwater Studies 33--Part II, and North Dakota Geological Survey Bulletin 74--Part II, 1981. 446 p, 2 fig, 1 Plate, 8 Tab, 26 Ref.

Descriptors: *Groundwater, *Data collections, *Aquifer characteristics, *Water quality, Water supply, Groundwater availability, Geohydrology, Wells, Groundwater recharge, Well data, Water yield, Potential water supply, Observation wells, Water level, Water users, *North Dakota, McHenry County.

The purpose of the investigation in McHenry County, N. Dak., was to provide detailed geologic and hydrologic information needed for the orderly development of water supplies for municipal, domestic, livestock, irrigation, industrial, and similar uses. Specifically, the objectives were to: (1) determine the location, extent, and nature of the major aquifers; (2) evaluate the occurrence and movement of groundwater, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the glacial aquifers; (4) estimate the potential yields of wells tapping the major aquifers; (5) evaluate the chemical quality of the groundwater; and (6) estimate the water use. The data in this report were collected chiefly between 1974 and 1978. The points of collection are shown. The data consist of the following: (1) Geologic and hydrologic records of wells and test holes; (2) water-level measurements in observation wells; (3) lithologic and geophysical logs of test holes and wells; (4) chemical analyses of groundwater; (5) chemical analyses of water from streams during low flow; (6) particle-size distribution graphs; (7) analyses of core samples for heavy-mineral content; and (8) hydraulic parameters and statistical characteristics of grain-size analyses. (USGS)
W81-05392

GROUNDWATER RESOURCES OF SHERIDAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
M. R. Burkart.
North Dakota County Groundwater Studies 32--Part III, and North Dakota Geological Survey Bulletin 75--Part III, 1981. 32 p, 10 Fig, 3 Plates, 3 Tab, 17 Ref.

Descriptors: *Groundwater, *Aquifer characteristics, Transmissivity, *Water yield, *Water quality, Chemical properties, Water supply, Groundwater availability, Geohydrology, Wells, Data collections, Water level fluctuations, Maps, Water use, *North Dakota, Sheridan County.

Groundwater in Sheridan County, N. Dak., is obtainable from aquifers in the upper Cretaceous bedrock and Quaternary glacial drift. Bedrock aquifers have a greater areal distribution, but those in the glacial drift provide a greater potential yield to individual wells. The major bedrock aquifers are the Fox Hills aquifer system and the Hell Creek-Fox Hills aquifer system. Yields from these aquifers are not expected to exceed 50 gallons per minute. The water generally is soft and a sodium bicarbonate type. Aquifers in the glacial drift--Lake Nettie system, Martin system, Butte, Painted Woods Creek, and North Burleigh--Underlie about 300 square miles in Sheridan County. Well yields of more than 500 gallons per minute may be expected in some parts of these aquifers. Water from these aquifers generally is hard. (USGS)
W81-05393

DATA FROM GEOTHERMAL WELLS NEAR OASIS, LOWER COACHELLA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05398

GROUND-WATER POTENTIAL OF THE GLACIAL DEPOSITS NEAR LOGANSPORT, CASS COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
D. C. Gillies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-225039, A06 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 81-7, April, 1981. 98 p, 25 Fig, 3 Tab, 27 Ref.

Descriptors: *Groundwater potential, *Glacial drift, *Water quality, *Groundwater availability, Aquifer characteristics, Geohydrology, Bedrock, Transmissivity, Groundwater movement, Streamflow, Flow characteristics, Model studies, Simulation analysis, Hydraulic properties, Infiltration, Selective withdrawal, Water level, Logging(Recording), *Indiana, Cass County.

The glacial deposits underlying a 260-square-mile area near Logansport, Indiana, range in thickness from 0 to 300 feet and consist of three semiconfined sand and gravel aquifer units separated and overlain by three semiconfining till units. The ground-water development potential of the two uppermost aquifers, whose thicknesses average about 20 feet each, is limited to domestic usage. However, a sand and gravel aquifer (0 to 120 feet in thickness) filling the bottom of the buried, preglacial Teays Valley probably has considerable development potential. Maximum and average transmissivities of the aquifer are about 38,000 and 13,000 square feet per day, respectively. The natural ground-water-flow system has not been significantly altered by development. Model simulation of the present system demonstrates that most of the water flowing through the glacial deposits originates within the study area as infiltrating precipitation and discharges locally into the major streams. Results of simulation of a withdrawal of 10 million gallons per day from the lower sand and gravel aquifer indicate an absence of hydrologic constraints to development of the quantities of ground water simulated in the model. However, model simulations of water-level declines of as much as 35 feet in the lower aquifer and 20 feet in the upper aquifer indicate that interference with the operation of domestic wells is likely. Model results also indicate that ground-water development similar to that simulated may cause streamflow to be reduced by only a small percentage. (USGS)
W81-05402

HYDROGEOLOGIC CONDITIONS IN THE COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
E. F. Vowinkel, and W. K. Foster.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $6.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-405, 1981. 39 p, 12 Fig, 7 Tab, 39 Ref.

Descriptors: *Geohydrology, *Aquifers, *Groundwater, *Hydrologic cycle, Aquifer characteristics, Geologic formations, Surface water, Precipitation, Streamflow, Runoff, Water loss, Water storage, Wells, Withdrawal, Induced infiltration, Recharge, Saline water intrusion, *New Jersey, Atlantic Coastal Plain.

A wedge-shaped mass of unconsolidated sediments composed of alternating layers of clay, silt, sand, and gravel underlies the Coastal Plain of New Jersey. The hydrologic units of this mass vary in thickness, lateral extent, lithology, and water-bearing characteristics. Some of the units act as aquifers, whereas other units act as confining layers. The entire sediment wedge is almost an independent and isolated hydrologic system. Components of the long-term hydrologic budget for the Coastal Plain are precipitation, streamflow, and water loss. Under natural conditions, average precipitation is about 44 inches per year; while streamflow and water loss are about 20 and 24 inches per year, respectively. More than 75 percent of the streamflow in the Coastal Plain is derived from ground-water runoff. Some activities of man have modified the natural hydrologic cycle in the Coastal Plain. The primary activity affecting the system has been the withdrawal of ground water. Major changes in the flow patterns of water in several aquifers have been recognized during the past few decades partially as a result of increasing groundwater withdrawal. Where head gradients are large enough, water can be induced to flow from adjacent surface-water bodies or through confining beds. Induced recharge from the Delaware River to the Potomac-Raritan-Magothy aquifer system is occurring as a result of pumping stresses in the outcrop area of the aquifer. Recharge from the river to the aquifer from Salem to Burlington County was estimated to be about 113 cubic feet per second in 1978. (USGS)
W81-05404

SELECTIVE ANNOTATED BIBLIOGRAPHY OF GEOLOGY AND GROUNDWATER RESOURCES FOR THE MONTANA PART OF THE NORTHERN GREAT PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 10C.
W81-05405

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, SEPTEMBER 1980,
Geological Survey, Tampa, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05407

GROUND-WATER LEVELS IN SELECTED WELL FIELDS AND IN WEST-CENTRAL FLORIDA. SEPTEMBER 1980,
Geological Survey, Tampa, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05408

APPROXIMATE WATER-LEVEL CHANGES IN WELLS IN THE CHICOT AND EVANGELINE AQUIFERS 1977-81 AND 1980-81, AND MEASURED COMPACTION 1973-81, IN THE HOUSTON-GALVESTON REGION, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05412

PRELIMINARY DELINEATION OF SALTY GROUND WATER IN THE NORTHERN ATLANTIC COASTAL PLAIN,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-05413

GROUNDWATER RESOURCES OF KWAJALEIN ISLAND, MARSHALL ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
C. D. Hunt, Jr., and F. L. Peterson.
Technical Report No 126, January, 1980. 91 p, 13 Fig, 18 Tab, 15 Ref, 6 Append.

Descriptors: *Groundwater management, *Atolls, *Groundwater recharge, *Groundwater storage, *Areal hydrology, Test wells, Pumpage, On-site data collections, Permeability coefficient, Salinity, Precipitation, Hydrologic budget, Groundwater availability, Kwajalein Island, Marshall Islands.

Twenty-three observation wells were constructed to evaluate the occurrence and movement of Kwajalein Island groundwater, with the aim of ensuring the optimal development of fresh groundwater resources while not exceeding long-term sustainable yields. From these wells, the thickness, areal extent, and quality of the Kwajalein groundwater lens was monitored. During the past year, freshwater storage at the lends has averaged 270 million gallons and has fluctuated more than 20 percent in response to recharge and discharge events. Because of time and seasonal limitations, it has not been possible to determine if long-term changes in lens storage are occurring. Recharge to the fresh groundwater lens from July 1978 to June 1979 was estimated to be 236 million gallons, 52 percent of the precipitation during this period. The areal distribution of recharge was found to be uneven, with some areas adjacent to paved surfaces receiving recharge at rates four times greater than other areas. An accurate evaluation of sustainable yield was not feasible because of the short time frame. It appears almost certain, however, that sustainable yield is greater than the rate of annual pumpage (33 million gallons during the 1978-1979 pumping year), and rough estimates indicate that it may exceed 50 million gallons per year. It is recommended that the lens monitoring program be continued for the next few years. (Garrison-Omniplan)
W81-05442

MATHEMATICAL MODEL OF SHALLOW WATER FLOW OVER POROUS MEDIA,
Middle East Technical Univ., Ankara (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W81-05496

SIMULATING MASS TRANSPORT IN UNCONFINED AQUIFERS,
California Univ., Berkeley. Lawrence Berkeley Lab.
V. Guvanasen, and R. E. Volker.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY4, p 461-477, April, 1981. 11 Fig, 1 Tab, 24 Ref.

Descriptors: *Mathematical models, *Mass transfer, *Unconfined aquifers, Flow measurement, Aquifer management, Water pollution sources, Saturation zone, Groundwater pollution.

A solution to the mass transport problem for unconfined aquifers is presented which employs the conventional weighted residual finite element method. The finite element mesh is changed iteratively to locate the new water table in each time step of the flow equation. Elements are allowed to expand and contract as required to accommodate the nonstationary saturated domain without the necessity for interpolation of solute concentration values when proceeding from one time step to another. Comparisons between the results of these models of flow and transport in a nonstationary saturated groundwater zone and those from experiments indicated that the models can accurately simulate the flow of water or pollutants. The models are primarily intended for the saturated zone, but they can also approximate the mass transfer as a result of the movement of the saturated-unsaturated interface. Thus, these models could be linked with independent unsaturated flow and transport models in areas where the flow in the unsaturated zone is significant. (Small-FRC)
W81-05497

TREATMENT OF TIME DERIVATIVE AND CALCULATION OF FLOW WHEN SOLVING GROUNDWATER FLOW PROBLEMS BY GALERKIN FINITE ELEMENT METHODS,
National Energy Authority, Reykjavik (Iceland).
For primary bibliographic entry see Field 7B.
W81-05503

DETECTION OF TRACE ORGANICS IN WELL WATER NEAR A SOLID WASTE LANDFILL,
Washington Univ., Seattle. Dept. of Environmental Health.
For primary bibliographic entry see Field 5A.
W81-05609

THE DECCAN BASALTS OF MAHARASHTRA, INDIA--THEIR POTENTIAL AS AQUIFERS,
Poona Univ., (India). Dept. of Geology.
S. B. Deolankar.
Ground Water, Vol 18, No 5, p 434-437, September/October, 1980. 1 Fig, 1 Tab, 18 Ref.

Descriptors: *Aquifer characteristics, *Basalts, Bombay, India, Geohydrology, Transmissivity, Water yield, Anisotropy.

The Deccan basalts, near Bombay, India, were evaluated as aquifers by analysis of large diameter dug wells. Five classes of basalts were identified. Weathered basalt (porosity 10-34%, specific yield 2-7%, transmissivity 90-200 sq meters per day) had the most desirable aquifer characteristics. Compact basalt and amygdoloidal basalt (porosity 0-4%,

specific yield 0-3%), devoid of divisional planes, were poor aquifers. Fractured-jointed basalt and some vesicular basalt were intermediate in production (porosity 5-15%, specific yield 0.5-10%, transmissivity 20-190 sq meters per day). Transmissivity values varied in different directions and from point to point, indicating that the Deccan basalts are anisotropic and heterogeneous. The aquifers are limited in extent. (Cassar-FRC)
W81-05700

2G. Water In Soils

REJUVENATION OF FAILED SOIL ABSORPTION SYSTEMS,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W81-05531

CHANGES IN SOIL PHYSICAL PROPERTIES DUE TO ORGANIC WASTE APPLICATIONS: A REVIEW,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Hydrology.
R. Khaleel, K. R. Reddy, and M. R. Overcash.
Journal of Environmental Quality, Vol 10, No 2, p 133-141, 1981. 2 Fig, 3 Tab, 50 Ref.

Descriptors: *Soil physical properties, *Organic wastes, *Land disposal, Water-carrying capacity, Density, Permeability coefficient, Regression analysis, Organic carbon.

Available information on the effects of the land application of organic wastes on soil properties is presented and discussed. Organic wastes include animal manure, municipal wastes, and sewage sludge. The effect of the increase in organic matter in soil on such properties as bulk density, water holding capacity at field capacity and wilting point, and saturated hydraulic conductivity is summarized. A linear regression analysis was performed, based on data from 12 sources, of observed increases in soil organic carbon as a result of waste applications on percent reduction in bulk density. The data on 21 soil types, 7 waste types, and 8 crop types indicated a highly significant relationship. An exponential multiple regression analysis of percentage sand and increase in organic carbon percentage on the percent increase in water holding capacity indicated that about 80% of the observed increases in water holding capacity at field capacity or wilting point could be due to variations in soil texture and soil organic carbon increases. Hydraulic conductivity and infiltration rate data were very limited and not sufficient for analysis. (Small-FRC)
W81-05589

THE CONTRIBUTION OF PHOSPHORUS LEACHED FROM CROP CANOPY TO LOSSES IN SURFACE RUNOFF,
Science and Education Administration, Durant, OK. Southern Plains Watershed and Water Quality Lab.
A. N. Sharpley.
Journal of Environmental Quality, Vol 10, No 2, p 160-165, 1981. 3 Fig, 5 Tab, 30 Ref.

Descriptors: *Phosphorus, *Surface runoff, *Standing crops, Rainfall, Soil chemistry, *Leaching, Canopy, Cropland.

The ability of simulated rainfall to leach phosphorus from growing plants was investigated using different age plants, different soil types, fertilizer phosphorus additions, soil-water stress, and a varying time interval between rainfall events. The proportion of soluble organic phosphorus in plant leachate was 8, 9 and 7% of the mean total soluble phosphorus concentration from cotton, sorghum, and soybean, respectively. These results were obtained 40 days after planting in Durant soil amended with 50 kg P/ha and did not increase with increasing soil P amendments. The soluble P concentration of surface runoff from Bernow and Houston Black soil amended with 50 and 100 kg P/ha after 42 days initially increased and then gradually decreased. The increase may be attributed to an increased input to surface runoff of leachate P from P accumulation on the leaf. The amount of P in surface runoff from bare soil was consistently less than that for planted soil. Plants grown on soils with a low P fertility contributed a major portion of the soluble P transported in surface runoff. (Small-FRC)
W81-05591

2H. Lakes

UPDATE ON ESTIMATION OF WATER SURFACE ELEVATION PROBABILITIES FOR THE GREAT SALT LAKE,
Utah Water Research Lab., Logan.
L. D. James, D. S. Bowles, W. R. James, and R. V. Canfield.
Water Resources Planning Series UWRL/P-81/01, February, 1981. 22 p, 5 Fig, 9 Tab, 8 Ref, 2 Append.

Descriptors: *Lakes, *Water level fluctuations, *Evaporation, *Probability distribution, *Model studies, Rainfall, Water level recorders, Computer models, Lake stages, Stochastic hydrology, Data collection, Multivariate analysis, Standard deviation, Mathematical studies, Multiobjective planning, *Great Salt Lake, Utah.

User groups suffer when water surface levels in the Great Salt Lake rise or fall more dramatically than their customary range. Standard methods for estimating the probabilities for riverine flood stages are not appropriate for terminal lakes because they do not account for the dependence of lake levels on the levels of immediately previous years. The techniques of operational hydrology, employing an autoregressive moving average (ARMA) (1,0) model, were used to replicate historical patterns of streamflow into, precipitation on, and evaporation from the Great Salt Lake. The results were combined with a lake water balance model used to simulate lake stage sequences beginning with known initial conditions and extending up to 125 years. The results will be used to generate probability distributions for future lake stages. Starting with a spring 1980 high stage of 4200.45 ft msl, the best estimate is that the 1981 spring high will be 4200.19. Over the long run, an average spring high of 4195.20 is forecast, with one year in a hundred reaching as high as 4205.21 and one other year in a hundred reaching a spring high of only 4185.19 and dropping as low as 4183.5. Each annual follow-up forecast will be published about July 1. The fundamental problem in applying higher order multivariate models to the Great Salt Lake is that the high cross correlations in the lagged data among the historical time series violated the assumptions of the homogeneous model. (Garrison-Omniplan)
W81-05440

DISTRIBUTION OF HEAVY METALS AND RADIONUCLIDES IN SEDIMENTS, WATER, AND FISH IN AN AREA OF GREAT BEAR LAKE CONTAMINATED WITH MINE WASTES,
Alberta Environmental Centre, Vegreville.
For primary bibliographic entry see Field 5B.
W81-05449

RESPONSE OF ONONDAGA LAKE TO RESTORATION EFFORTS,
Syracuse Univ., NY. Dept. of Civil Engineering.
S. W. Effler, S. D. Field, M. A. Meyer, and P. Sze.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 191-210, February, 1981. 7 Fig, 8 Tab, 61 Ref.

Descriptors: *Eutrophic lakes, *Lake restoration, *Rehabilitation, Water pollution prevention, Detergents, Phosphorus, Heavy metals, Water quality, Cyanophyta, Syracuse, New York.

The continuing restoration program for Onondaga Lake, Syracuse, New York, is described, and certain lake characteristics and responses which may influence future system responses and quality are discussed. The pre-reclamation (1969) lake conditions are described, and the changes in the ecosystem coincident with the program are discussed in terms of limnology. Reclamation measures include a ban on high phosphate detergents, increased maintenance of the combined sewer system, and reduction of heavy metal loadings. By 1975, there had been dramatic reductions in phosphorus loadings and no significant contribution of blue-green algae to the phytoplankton biomass. The population of larger daphnids increased significantly. Reductions in chromium, copper, and iron concentrations were apparent by 1975. The lake remains nutrient saturated, but this may change after a new tertiary treatment plant is built in 1981. Mercury level reductions were seen in fish in 1978 which gives encouragement to the idea that the environmental risks in the lake can be overcome. (Small-FRC)
W81-05489

FOSSIL DIATOM ASSEMBLAGES AFTER EUROPEAN SETTLEMENT FROM FOUR LAKES IN LAKE AND NEWAYGO COUNTIES, MICHIGAN (USA),
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W81-05505

DISTRIBUTION AND SALINITY ADAPTATIONS OF BANGIA ATROPURPUREA (RHODOPHYTA), A PUTATIVE MIGRANT INTO THE LAURENTIAN GREAT LAKES,
British Columbia Univ., Vancouver. Dept. of Botany.
R. G. Sheath, and K. M. Cole.
Journal of Phycology, Vol 16, No 3, p 412-420, 1980. 14 Fig, 2 Tab, 25 Ref.

Descriptors: *Adaptation, *Bangia, *Salinity, Lakes, Photosynthesis, Distribution, Migration, *Algae, *Great Lakes.

Bangia atropurpurea (Roth) Ag., probably introduced from the Atlantic Ocean via the St. Lawrence Seaway, was observed growing abundantly along the north and east shorelines of Lake Erie and Lake Ontario. One population was found in Lake Huron. These marine plants were studied for three generations to gain insight on their adaptation from saline water to fresh water. Only asexual forms of Bangia were observed. First generation germlings derived from freshwater parents grew for 18 days at all salinities from 1 to 26 o/oo, having greater rates at lower salinities. Germlings derived from parents incubated in seawater also grew in all salinities from 1 to 26 o/oo, growth rates being best at 1 and 9 o/oo salinity. The second and third generations from freshwater lineage grew best at the lowest salinity, 1 o/oo. Plants from seawater derivation grew best at 19 o/oo in the second generation and 19 and 26 o/oo in the third generation. Thus, bangia originally collected in freshwater shifted in optimum salinity from 1 to 26 o/oo when incubated at 26 o/oo for each generation. Filaments of Bangia tolerated up to 13 o/oo salinity for 15 minutes without a reduction in photosynthetic rate. Microscopic analysis of freshwater derived plants subjected to 26 o/oo salinity showed a rearrangement of thylakoids in the pyrenoid region. Photosynthetic rate was reduced by half. Seawater derived plants did not show these aberrations. The three chromosomes found in these plants concur with counts on marine Bangia (Cassar-FRC)
W81-05542

AQUATIC SEDIMENTS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2J.
W81-05560

PHYTOPLANKTON STUDIES IN THE BRACKISH LAKE NAKANOUMI, JAPAN. I. PHYTOPLANKTON IN LAKE NAKANOUMI, 1974-1978,

Shimane Univ., Matsue (Japan). Dept. of Agricultural Chemistry.
H. Ohtake, K. Kondo, N. Hayashi, K. Oda, and S. Kawata.
Archiv fur Hydrobiologie, Vol 90, No 3, p 309-323, November, 1980. 8 Fig, 5 Tab, 5 Ref.

Descriptors: *Phytoplankton, *Saline water, *Lakes, Distribution patterns, Baseline studies, Pre-impoundment, Ecology, Habitats, Aquatic life, *Lake Nakanoumi, Japan, Water quality, Algae, Lagoons.

Lake Nakanoumi, a brackish lake with an open connection to the Japan Sea, was studied for five years, 1974-1978, prior to beginning a project to freshen the water for irrigation use. Three factors were responsible for phytoplankton distribution: water temperature, salinity (0.52 to 2.18%), and water quality. Maximum phytoplankton observed was 150 million cells per liter during a bloom of Cyclotella sp. and blue-green algae. The total number of phytoplankton species was 66: 43 Bacillariophyceae, 10 Chlorophyceae, 7 Cyanophyceae, 5 Dinophyceae and 1 Cryptophyceae. Green and blue green algae were abundant in the low-salinity region; diatoms, in the more saline water. Where water quality was poor, the flagellates Prorocentrum minimum and Cryptomonas sp. were numerous. When the water is freshened, the phytoplankton distribution will be drastically altered, some species disappearing entirely. (Cassar-FRC)
W81-05645

PHYTOPLANKTON STUDIES IN THE BRACKISH LAKE NAKANOUMI, JAPAN. II. NUMERICAL CLASSIFICATION OF PHYTOPLANKTON SPECIES BASED ON THE LIKENESS OF OCCURRENCE,
Shimane Univ., Matsue (Japan). Dept. of Agricultural Chemistry.
H. Ohtake, K. Oda, K. Kondo, and Y. Date.
Archiv fur Hydrobiologie, Vol 90, No 4, p 397-409, January, 1981. 4 Fig, 3 Tab, 11 Ref.

Descriptors: *Phytoplankton, *Population dynamics, Temperature effects, Aquatic plants, Brackish water, Plankton, Algae, Salinity, Nitrogen, Nutrients, Phosphorus, Chemical properties, *Lakes, *Japan.

Phytoplankton species were classified numerically based on the likeliness of occurrence from the data collected during the period of 1974-1978 from the brackish lake Nakanoumi, in Japan. The lake is a typical transitional region between limnic and marine habitats. The phytoplankton distribution has certain seasonal and regional features. Patterns of phytoplankton populations were obtained and related to major environmental factors which appeared to be responsible for the species occurrence. A total of 66 species were found during the study period. However, 17 of these were rare species, and were removed from the data before analysis. The 49 remaining species were classified into seven species groups with different patterns of occurrence. Group I was composed mostly of diatoms, occurring during the colder seasons throughout the lake. Group II was composed of seven diatom and three flagellated species with salient seasonal and regional features. Group III was composed of 8 algal species confined to the western part of the Ohashi Canal. Group IV was closely related to salinity factors. Group V was composed of 3 algal species occurring during September to October, possibly due to nutrient release. Group VI contained four diatom species restricted to high salinity areas. Group VII contained three species found in August when water temperatures ranged above 25 degrees C. Factors such as temperature, salinity and concentrations of phosphorus and nitrogen influenced the distribution patterns of the seven groups. (Baker-FRC)
W81-05646

A PRELIMINARY LIMNOLOGICAL SURVEY OF SWARTWATER DAM (QWA-QWA),
Orange Free State Univ., Bloemfontein (South Africa). Inst. for Environmental Science.
P. Stegmann, A. J. H. Pieterse, D. F. Toerien, M. T. Seaman, and B. C. W. Van Der Wall.
Water S. A., Vol 7, No 1, p 16-27, January, 1981. 5 Fig, 12 Tab, 36 Ref.

Descriptors: *Reservoirs, *Primary production, *Limnology, Lake stages, Chlorophyll a, Eutrophication, Chemical stratification, *Swartwater Dam, *South Africa.

A preliminary limnological survey was performed at Swartwater Dam, a major impoundment with a full surface area of 70.25 ha and a maximum depth of 18 m. The relatively small (19.2 sq km) catchment area is grassland with little erosion. The survey found a distinct oxycline in the absence of a distinct thermocline. There was chemical stratification, but generally low ionic content, although ionic content increased markedly in the anaerobic hypolimnion. There was a deeper penetration of light with long wavelengths in the humically stained water. The water had primary production rates, chlorophyll a concentrations, and phytoplankton populations that are generally associated with mesctrophic conditions. Zooplankton and zoobenthos counts indicated a low secondary production level. Water for potable uses should not be withdrawn from the hypolimnion, as iron and manganese contents are high. The temperature is suitable for the production of trout in cages, but anaerobic hypolimnion conditions during stratification could be hazardous to all fish. Eutrophication may be a future problem if increased recreational use is made of the impoundment. (Small-FRC)
W81-05692

2I. Water In Plants

GROWTH RESPONSE OF SPECKLED ALDER AND WILLOW TO DEPTH OF FLOODING,
Forestry Sciences Lab., Grand Rapids, MN.
M. D. Knighton.
Forest Service Research Paper NC-198, 1981. 6 p, 5 Fig, 4 Tab, 13 Ref. North Central Forest Experiment Station, St. Paul, Minnesota.

Descriptors: *Flooding, *Shrubs, *Wildlife management, Marsh management, Willow trees, Oxygen requirements, Bushes, Environmental effects, *Soil-water-plant relationships, *Water-impoundments, *Flooding tolerance, Alnus rugosa, Salix spp.

Growth and survival of speckled alder and willow were determined for two growing seasons with continuous flooding at different depths. Growth was at least four times greater when the water table was below the root crown than when it was 15 cm above. Mortality increased with flooding depth and was greatest for alder.
W81-05430

2J. Erosion and Sedimentation

TOTAL LOAD TRANSPORT IN ALLUVIAL CHANNELS,
Roorkee Univ. (India). Dept. of Civil Engineering.
K. G. Ranga Raju, R. J. Garde, and R. C. Bhardwaj.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY2, p 179-191. February, 1981. 6 Fig, 1 Tab, 13 Ref.

Descriptors: *Sediment transport, *Alluvial channels, *Sediment load, Mathematical equations, Canals, Alluvial rivers, Rivers, Channels, Flumes, Bed load, Suspended load.

Total load transported in alluvial channels was expressed as a function of the Darcy-Weisbach friction factor, average bed shear stress corresponding to grain roughness divided by average bed shear stress, and shear velocity divided by fall velocity of sediment in still fluid. The equation was derived from a large amount of data collected in flumes and streams under equilibrium conditions, excluding the wash load. Ripple-dune and transition regimes were chosen for analysis. Several relations for transport from the literature were compared with observed data. The Ackers and White method had an error in predicted transport rate of plus or minus 50% for 80% of the data. The Engelund and Hansen equation produced low sediment transport rates. The Graf and Acaroglu work used a complex equation, which could be simplified. The equation developed in this paper is more accurate than some of the existing total load equations. (Cassar-FRC)
W81-05474

SEDIMENT YIELD FROM CULTIVATED LANDS: SELECTED BIBLIOGRAPHY,
Stottler Stagg and Associates, Inc., San Antonio, TX.
F. D. Masch, M. A. Ports, and A. R. Robinson.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY1, p 124-126, January, 1981. 15 Ref.

Descriptors: *Bibliographies, *Erosion, *Sediment yield, Model studies, Cultivated lands, *Agricultural runoff, Sediment transport.

A bibliography of 15 recent selected references on predicting sediment yield from agricultural land was compiled by the Sedimentation Committee of the Hydraulics Division, American Society of Civil Engineers. The Committee recognizes the significance of uncontrolled erosion, which yields between 500 million and 4 billion tons of sediment annually. Many evaluation procedures and simulation techniques for estimating sediment loss have been developed, including some recent models which have added deterministic predictors to previously empirical solutions. (Cassar-FRC)
W81-05482

IDENTIFICATION OF BEDFORMS IN LOWER COOK INLET, ALASKA,
Geological Survey, Corpus Christi, TX.
For primary bibliographic entry see Field 7B.
W81-05521

AQUATIC SEDIMENTS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
J. V. DePinto, T. C. Young, and S. C. Martin.
Journal of the Water Pollution Control Federation (Literature Review Issue), Vol 52, No 6, p 1656-1670, June, 1980. 172 Ref.

Descriptors: *Sediments, *Bottom sediments, *Lake sediments, *Great Lakes, *Organic compounds, *Heavy metals, *Nutrients, Model studies, Sediment transport, Path of pollutants, Aquatic soils, Lakes, Analytical techniques, Sampling, Literature review, Sediment-water interfaces, Phosphorus compounds, Pesticides.

A review of the 1979 literature on aquatic sediments includes a consideration of new methodology manuals fro ASTM and EPA on sediment analysis. Several reports were published on management of bottom sediments containing toxic substances; individual papers appeared on a wide variety of topics including analytical and sampling methods; distribution, transport, and concentration of heavy metals in sediments; sediment characterization and sediment-water interchange were additional study topics, along with biological availability and biological activity of nutrients. The occurrence and fate of organic substances such as pesticides, polychlorinated biphenyls, and methane formed the subject of continuous investigations. Empirical studies were followed by development of mathematical models, especially for fluvial sediment transport and transport of related pollutants, including phosphorus. (Cassar-FRC)
W81-05560

THE PETERSON LIMESTONE-EARLY CRETACEOUS LACUSTRINE CARBONATE DEPOSITION IN WESTERN WYOMING AND SOUTHEASTERN IDAHO,
Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
S. W. Glass, and B. H. Wilkinson.
Sedimentary Geology, Vol 27, No 2, p 143-160, August, 1980. 6 Fig, 25 Ref.

Descriptors: *Limestone, *Geologic history, *Flood plains, Paleosols, Soil types, *Fluvial sediments, River basin development, *Peterson limestone, *Wyoming, *Idaho.

The lacustrine Peterson Limestone of western Wyoming and southeastern Idaho is made up of two floodplain deposition areas and paleosols, and shallow near-shore and deeper lacustrine sediments. Specifically, the six lithofacies that compose its 20,000 sq km area are: calcareous sandstone and shale, red nodular limestone, pink sandy micrite, biomicrite, graded silty micrite, and limestone conglomerate. A large, fresh, hardwater lake surrounded by fluvial systems and associated flood plains in a warm temperate climate was the system from which the limestone developed. Around Lake Peterson, well-oxidized sandy terrigenous rocks and paleosol nodules indicate that flood plain deposition preceded and was simultaneous with lacustrine carbonate deposition. In the deeper parts of the basin, micrite and biomicrite were formed, while sandy and silty carbonate accumulated in shallower lake-margin areas. Lake Peterson was similar to modern playas, although there is no known modern system exactly like it. (Small-FRC)
W81-05628

2K. Chemical Processes

CALCIUM PHOSPHATE PRECIPITATION IN AQUEOUS CALCITIC LIMESTONE SUSPENSIONS,

State Univ. of New York Coll. at Plattsburgh. Inst. for Man and Environment.
J. L. Brown.
Journal of Environmental Quality, Vol 9, No 4, p 641-644, October/December, 1980. 6 Fig, 1 Tab, 17 Ref.

Descriptors: *Phosphates, *Calcium compounds, *Chemical precipitation, Limestone, Chemical reactions, Wastewater treatment, Fluorides, Chemistry of precipitation, Calcium phosphate, Phosphorus removal.

Phosphate precipitation was studied by reacting dilute (0.3 mM) phosphate solutions with aqueous suspensions of calcitic limestone. This represents a possible method of removing phosphates from domestic wastewaters. The rate of phosphate disappearance increased with both pH elevation from 7.0 to 8.4 and addition of hydroxyapatite seed crystals. Sodium fluoride, 0.1 to 0.2 mM, strongly increased phosphate disappearance independently of pH, but only in the presence of seed crystals. This suggests precipitation of hydroxyapatite or fluorapatite, but this was not confirmed. At pH 7.0 in the presence of fluoride and seed crystals, phosphate was reduced to about 0.01 mM in two hours and almost zero in 18 hours. (Cassar-FRC)
W81-05536

AN OCCURRENCE OF CALCIUM HYDROXIDE GROUND WATER IN JORDAN,

Harza Engineering Co., Chicago, IL
M. Saines, P. Dickson, and P. Lambert.
Ground Water, Vol 18, No 5, p 503, September/October, 1980. 1 Tab, 2 Ref.

Descriptors: *Calcium hydroxide, *Springs, *Chemical properties, Groundwater, Hydrogen ion concentration, Alkaline water, Dissolved solids, *Jordan.

Natural calcium hydroxide groundwater with a pH of 12.7, the highest ever reported, was discovered in the Yarmouk Valley, Jordan. This water has 4,736 mg per liter total dissolved solids, 7,400 micromnos per cm conductivity and 35.43 meq per liter Ca. The water originates from rainfall percolating through 100 meters of rock rich in portlandite (Calcium hydroxide), which was formed by combustion metamorphism of kerogen-rich marl and limstone. (Cassar-FRC)
W81-05699

2L. Estuaries

DETERMINATION OF BENZO(A)PYRENE, HEXACHLOROBENZENE AND PENTACHLOROPHENOL IN OYSTERS FROM GALVESTON BAY, TEXAS,

Texas A and M Univ., College Station. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W81-05456

EVALUATION OF SAND WAVES IN AN ESTUARY,

Oregon State Univ., Corvallis. Dept. of Civil Engineering and Ocean Engineering.
B. R. Baliga, and R. T. Hudspeth.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY2, p 161-178, February, 1981. 10 Fig, 1 Tab, 22 Ref.

Descriptors: *Estuaries, *Sand waves, *Dredging, Sediment transport, Environmental effects, Mathematical studies.

The rate of sediment turnover (RST) in the Bella-Williamson dissection plane method for determining chronic environmental impacts of dredging in estuaries may be quickly located by using the equilibrium subrange and the total energy (variance of the spatial sequence) of the wave number spectrum for sand waves. The sand wave profile may be measured by underwater sonic profilers, and the wave number spectral amplitude may be estimated by an FFT (Finite Fourier Transform) algorithm. A comparison of the rms (root mean square) wave height, which may be determined from the total energy content computed by the FFT coefficients, with the equilibrium subrange of the theoretical wave number spectrum provides a reasonable estimate of the RST. The method may be extended to compute the wave frequency spectrum without requiring the measurement of a temporal sand wave profile provided that a dispersion transformation between wave frequencies and wave numbers is known. In addition, recommendations are presented for extending the present knowledge of the wave number equilibrium subrange and the wave frequency dispersion transformation for sand waves under oscillatory flows. (Cassar-FRC)
W81-05469

ENERGY FLOW THROUGH THE FIDDLER CRABS UCA PUGNAX AND U. MINAX AND THE MARSH PERIWINKLE LITTORINA IRRORATA IN A NORTH CAROLINA SALT MARSH,

North Carolina State Univ. at Raleign. Dept. of Botany.
L. M. Cammen, E. D. Seneca, and L. M. Stroud.
American Midland Naturalist, Vol 103, No 2, p 238-250. April, 1980. 1 Fig, 3 Tab, 28 Ref.

Descriptors: *Energy, *Salt marshes, *Invertebrates, Growth rates, Crabs, Ecosystems, Primary production, Estuaries, Cape Fear River, *North Carolina.

As part of an attempt to formulate an energy budget for an entire salt marsh ecosystem, an energy budget was constructed for the dominant invertebrates, fiddler crabs Uca pugnax and U. minax, and the marsh periwinkle, Littorina irrorata. The marsh was a Spartina alterniflora marsh in the Cape Fear River Estuary, North Carolina. Production, respiration and assimilation in kcal/sq m/yr were: 51, 55, and 106 for U. pugnax, 13, 44, and 58 for U minax, and 8, 94, and 101 for L. irrorata. Assimilation efficiencies were found to be relatively low, at 9% for U. pugnax, 8% for U. minax, and 14% for L. irrorata. Net growth efficiencies were determined by the ratio of production to assimilation, and were 48% for U. pugnax, 23% for U. minax, and 7% for L. irrorata. The three species together consumed about one-third of the net production of the emergent marsh and assimilated about one-tenth of that amount. The values found in this study for energy flow appear to be low in relation to previous studies, but methodology and locations varied. (Small-FRC)
W81-05507

ELIMINATION OF LABORATORY-ACQUIRED CADMIUM BY THE OYSTER CRASSOSTREA VIRGINICA IN THE NATURAL ENVIRONMENT,

Food and Drug Administration, Dauphin Island, AL. Gulf Coast Technical Services Unit.
D. E. Mowdy.
Bulletin of Environmental Contamination and Toxicology, Vol 26, No 3, p 345-351, March, 1981. 1 Tab, 12 Ref.

Descriptors: *Cadmium, *Oysters, Shellfish, Fate of pollutants, Estuarine environment, Dauphin Bay, Alabama, Marine animals, *Detoxification, Oyster relaying.

Oysters dosed with 0.1 mg per ml cadmium for 9 days out of 76 days of confinement in flumes supplied by flowing estuarine water accumulated 10.4 ppm Cd compared with 0.4 ppm for undosed controls. The contaminated oysters were then suspended in trays from a pier in Dauphin Bay and analyzed at intervals to determine the rate of Cd elimination. After 147 days immersion in the natural estuarine water, Cd-contaminated concentrations in oyster tissue fell from the original 5.9 ppm to 1.3 ppm. Intermediate Cd concentrations (ppm) were: 19 days, 4.9; 36 days, 3.9; 60 days, 3.0; 104 days, 2.1; and 133 days, 1.7. Little Cd elimination occurred during periods of low salinity and at temperatures above 32C and below 7C. The more rapid depuration in the first 42 days of immersion suggested the presence of unbound Cd. The slower elimination in the latter part of the study may have been a result of the presence of bound Cd. (Cassar-FRC)
W81-05522

MATHEMATICAL MODELING OF DISPERSION IN MIXED ESTUARIES,

Y. F. Ozturk.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 211-228, February, 1981. 5 Fig, 3 Tab, 28 Ref.

Descriptors: *Mixing, *Estuaries, *Mathematical models, Model studies, Coasts, Flow, Tidal effects, Water currents, *Salinity, *Brisbane River Estuary, Australia.

A dispersion equation was applied to mathematically model the dispersion in the Brisbane River Estuary, Australia. In this estuary, salinity near the surface and near the bed were similar, indicating a mixed or slightly stratified system. In the model, isotropic flow conditions were a function of real time flow depth and four thirds power of the real time tidal velocity. The model represented adequately the rates of dispersion in the estuary. Certain parameters were adjusted by trial and error. The consistency index was estimated by measurable hydraulic parameters, allowing the dispersion coefficient to be defined directly by the time variable flow depth and tidal velocity available in the mathematical hydraulic model. A computer generated table of constants is presented which can be used. Field studies are needed to verify and refine the model. (Small-FRC)
W81-05528

LONG-TERM SALINITY CALCULATION IN DELAWARE ESTUARY,

Najarian, Thatcher and Associates, Inc., Closter, NJ.
M. L. Thatcher, and D. R. F. Harleman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 11-27, February, 1981. 12 Fig, 1 Tab, 17 Ref.

Descriptors: *Mathematical models, *Estuaries, *Saline-freshwater interfaces, Water currents, Salinity, Channel inflow, Chlorides, *Delaware River, Delaware Estuary.

A long-term salinity calculation method was applied to the Delaware Estuary, a coastal plain estuary with time varying salinity distributions. The model is a function of observed or prescribed values of freshwater inflows and varying surface elevations at the ocean boundary. The development, modification, and application of the calculating technique are described. The model was run for a one year period or a total of 704 tidal cycles. Model results were compared with those observed at the USGS water quality observation stations. Problems with the model include the representation of the dispersive effects of channel irregularities by a constant multiplier times the Taylor coefficient. Also, the short-term variations in tributary inflow chloride concentration cannot be accurately simulated by using correlations between chloride discharge and influx. Also, the model does not predict the effects of the C&O canal, and local wind effects are not considered. Despite its limitations, the model did an acceptable job of predicting chloride concentrations over a wide range of freshwater inflow conditions. (Small-FRC)
W81-05529

SUSPENDED SOLIDS ANALYSIS OF ESTUARINE SYSTEMS,
Manhattan Coll., Bronx, NY. Environmental Engineering and Science.
D. J. O'Connor, and W. Lung.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 101-120, February, 1981. 12 Fig, 32 Ref.

Descriptors: *Estuaries, *Suspended solids, *Water currents, Sediments, Mathematical models, Salinity, Eddies, Salinity currents, Water circulation.

A practical engineering method is presented to analyze estuarine circulation and the associated suspended solids distribution. A two-layer salinity and suspended solids model is presented which includes a seaward advective flow in the surface layer, landward in the bottom layer, vertical advective flow, vertical dispersion across the layer interface, and the settling of suspended solids. The horizontal and vertical transport coefficients are evaluated using a simple hydrodynamic analysis. The eddy dispersion coefficient is estimated from eddy viscosity using an empirical relationship with the Richardson number determined in the velocity equation. Particle settling velocity can also be estimated. The analysis is applied to the Sacramento-San Joaquin Delta and the James River estuary to demonstrate the validity of the approach. Theoretical and experimental work is needed to develop measurement methods for eddy viscosity and dispersion coefficients, settling velocities of cohesive particles, and the exchange with and motion of the bed. (Small-FRC)
W81-05535

THE CONTRIBUTION OF BACTERIA TO THE TOTAL ADENOSINE TRIPHOSPHATE EXTRACTED FROM THE MICROBIOTA IN THE WATER OF A SALT-MARSH CREEK,
South Carolina Univ., Columbia. Dept. of Biology.
C. A. Wilson, L. H. Stevenson, and T. H. Chrzanowski.
Journal of Experimental Marine Biology and Ecology, Vol 50, No 2/3, p 183-195, 1981. 5 Fig, 3 Tab, 31 Ref.

Descriptors: *Adenosine triphosphate, *Bacteria, *Salt marshes, *Estuaries, Streams, Tidal marshes, Biomass, Ecosystems, Bacterial analysis.

The estimation of total microbial biomass, which is an element in the characterization of aquatic ecosystems, can be accomplished by the measurement of cellular adenosine 5'-triphosphate (ATP). However, the ATP assay is nondiscriminatory since it does not distinguish between the contributions of various biota. This study investigated the feasibility of passing a water sample through a 1.0-micrometer filter (Nucleopore) to remove the nonbacterial organisms from the sample and thus permit determination of the relative contribution of bacterial ATP to the total pool of ATP in environmental samples. The nonbacterial organisms are retained on the filter. The quantification of ATP and the enumeration of bacteria (by epifluorescence microscopy) were performed on filtered and unfiltered portions of each sample and on cultured organisms. The values of ATP per cell averaged 1.48 times ten to the minus fifteenth power grams per cell from laboratory cultures and generally two orders-of-magnitude lower in bacteria from the natural system, with values ranging from 0.24 to 28.8 times 10 to the waters, the higher values of ATP per cell were observed in samples collected during the warmer months. Higher values of ATP per cell were observed in samples collected at low tide than in those collected at high tide. The contribution of the bacterial ATP to the total microbiota ATP ranged from less than 1 to 83 percent, with an average value of about 25 percent. Generally, waters from the high marsh, which was strongly influenced by sediment microbes and was not markedly influenced by the tides, contained a greater percentage of bacterial ATP. (Carroll-FRC)
W81-05540

GROUPING AND CLASSIFICATION APPLIED TO THE STUDY OF THE DISTRIBUTION OF THE BENTHIC EPIFAUNA OF THE LOWER ESTUARY AND GULF OF SAINT LAWRENCE. (GROUPEMENT ET ORDINATION APPLIQUES A L'ETUDE DE LA REPARITION DE L'EPIFAUNE BENTHIQUE DE L'ESTUAIRE MARITIME ET DU GOLFE DU SAINT-LAURENT),
Laval Univ., Quebec. Dept. de Biologie.
P. Fradette, and E. Bourget.
Journal of Experimental Marine Biology and Ecology, Vol 50, No 2/3, p 133-152, 1981. 3 Fig, 4 Tab, 51 Ref.

Descriptors: *Estuaries, *Benthic fauna, *Population density, Biomass, Sampling, Mathematical studies, Aquatic populations, Canada, *Gulf of Saint Lawrence, Multivariate analysis, Ecosystems.

A series of 47 navigation buoys was used to collect quantitative samples of epibenthic fauna in the Lower Estuary and Gulf of St. Lawrence in Canada. Sessile species and biomass composition were used to describe stations, which were grouped using multivariate analysis. A Gower similarity index, modified to take into account the importance of each species in the ecosystem, was used to compare stations. Cluster and principal coordinate analyses showed comparable relations between stations. The North Shore and Gaspe Coast stations were separated from those of the Lower North Shore, the Mingan Island sector, and the Lower Estuary. Stations from the Lower North Shore were also separated from those of the Mingan Island region and of the Lower Estuary, but at a higher level of similarity. All animal assemblages consisted of the following sessile species: Obelia longissima (Pallas), Hiatella arctica (L.), Mytilus edulis L., Balanus balanoides (L.), and B. crenatus (Bruguiere). These species formed over 95 percent of biomass of all sessile species. Differences between the various station assemblages were mainly due to changes in the relative abundance of these species. The geographical gradient of summer surface water temperature best explains the observed clusters. In the Lower Estuary, the spatio-temporal variations of physicochemical factors and the surface circulation may influence the number of species and their abundance. The circulation systems of the Lower Estuary and near the Mingan Islands might account for the similarity between their assemblages. The same dominant species, Obelia longissima, characterizes the fauna of these two regions. (Carroll-FRC)
W81-05541

GEOMETRY OF TIDAL INLETS: EMPIRICAL EQUATIONS,
Coastal Engineering Research Cener, Fort Belvoir, VA.
C. L. Vincent, and W. D. Corson.
Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers, Vol 107, No WW1, p 1-9, February, 1981. 5 Fig, 1 Tab, 3 Ref.

Descriptors: *Graphical analysis, *Inlets, *Tidewater, Tidal effects, *Geomorphology, Mathematical studies, Channels, Waves.

Relationships are presented between physiographic parameters of an inlet such as channel lengths and depths for tidal inlets. An examination of physiographic parameters would show any characteristic variations in inlet geometry and provide information on whether inlet geometry tends toward an equilibrium. It is difficult, if not impossible, to measure wave and tide parameters. Sixty-seven inlets were studied, and empirical formulae were derived. Parameters were plotted against each other, and those plots that showed promise were analyzed through standard linear and power curve fitting analysis. For example, parameters were plotted against cross-sectional area and the ratio of inlet width to inlet length. A fairly strong coherence of inlet geometry was found, from which it was inferred that inlet geometry tends to be self-adjusting to wave-tide regime. The results can be used in the planning of inlet modifications. (Small-FRC)
W81-05544

TIDAL FRESHWATER MARSH ESTABLISHMENT ON DREDGE SPOILS IN THE COLUMBIA RIVER ESTUARY,
Washington State Univ., Pullman. Coll. of Agriculture Research Center.
M. E. McVay, P. E. Heilman, D. M. Greer, S. E. Brauen, and A. S. Baker.
Journal of Environmental Quality, Vol 9, No 3, p 488-493, July/September, 1980. 1 Fig, 4 Tab, 27 Ref.

Descriptors: *Marsh management, *Planting management, *Marsh plants, Aquatic plants, Rivers, Nutrients, Potassium, *Tidal marshes, Salt marshes, Tidal flats, *Columbia River, Nitrogen, Phosphorus, Fertilizers, Estuaries.

Marsh establishment through the seeding and transplanting of tufted hairgrass and slough sedge was investigated on sandy material in an intertidal location in the Columbia River Estuary. Treatments were made with single and split applications of a mixed nitrogen, phosphorus, and potassium fertilizer. Survival and growth of plants and the concentrations of N, P, and K in the plant tissues were monitored. Survival and biomass production differed significantly with respect to elevation, with few plants of either species surviving after the first winter below 0.7 meters above Mean Lower Low Water (MLLW). The best growth of tufted hairgrass transplants was in upper elevations, about 1.9 meter above MLLW, but satisfactory stands were found at about 0.9 meters above MLLW. The best growth of slough sedge was at middle elevations of about 1.1 meter above MLLW, with satisfactory growth to about 0.8 meters above MLLW. Direct seeding was not satisfactory for establishing the species. Natural seeding of tufted hairgrass did begin in the second year of the plantings in protected areas. Fertilizer significantly increased tufted hairgrass growth during both seasons, particularly at the upper tier. With slough sedge, except for a slight increase in the number of culms, fertilizer had no significant effect on growth in either year. Tufted hairgrass seems better than slough sedge in terms of both biomass and seed production for use in marsh establishment. (Baker-FRC)
W81-05564

ARSENIC IN U.K. ESTUARINE SEDIMENTS AND ITS AVAILABILITY TO BENTHIC ORGANISMS,
Marine Biological Association of the United Kingdom, Plymouth (England).
W.J. Langston.
Journal of the Marine Biological Association of the United Kingdom, Vol 60, No 4, p 869-881, 1980. 7 Fig, 3 Tab, 22 Ref.

Descriptors: *Estuaries, *Arsenic, *Benthos, Water pollution, Sediments, *Great Britain, Aquatic soils, Toxins, Iron.

Experimental studies have shown that several marine organisms can accumulate arsenic from

contaminated water and food. Although there is some evidence that high arsenic levels in marine organisms are linked to environmental levels, few data showing direct relationships are available. This study investigated the relationship between environmental arsenic occuring in estuarine sediments and arsenic levels in selected organisms from 27 estuaries in England and Wales. Total arsenic concentrations in the estuarine sediments ranged from 2 micrograms per gram to 2500 micrograms per gram, with the highest concentrations occurring in sediments of estuaries associated with past or present metalliferous mining. Strong correlations were found between arsenic and iron in 1 N-hydrochloric acid extracts of different estuarine sediments, with the arsenic to iron ratios ranging from 0.0011 in estuaries not contaminated with mine wastes to 0.0190 in metalliferous sediments. Concentrations of arsenic in estuarine organisms were found to correlate more significantly with the arsenic to iron ratio in sediments than with arsenic levels alone. The highest arsenic concentrations in organisms occurred in estuaries where the sediment contained high arsenic to iron ratios. This relationship was most evident in the bivalve Scrobicularia plana (da Costa), in which the proportion of readily extractable iron in sediments mediates the availability of arsenic to the animal in a predictable way. (Carroll-FRC)
W81-05577

TEMPORAL VARIATIONS IN ANNUAL PRODUCTION AND BIOMASS IN ESTUARINE POPULATIONS OF TWO POLYCHAETES, NEPHTYS HOMBERGI AND AMPHARETE ACUTIFRONS,
Institute for Marine Environmental Research, Plymouth (England).
R. Price, and R. M. Warwick.
Journal of the Marine Biological Association of the United Kingdom, Vol 60, No 2, p 481-487, 1980. 2 Fig, 2 Tab, 14 Ref.

Descriptors: *Estuaries, *Polychaetes, *Population dynamics, Animal populations, Annelids, Biomass, Aquatic productivity.

The usefulness of most information on production rates and production/biomass ratios of macrobenthic species is limited by a lack of data on their temporal and spatial stability. This study investigated the stability of the production, biomass, and production/biomass ratio values of two polychaete species, Nephtys hombergi Savigny and Ampharete acutifrons (Grube), over a 5-year period, from October 1972 through October 1977, in the estuary of the River Lynher in Great Britain. for Nephtys, production ranged from 6.00 to 2.84 grams dry weight per sq m. Biomass for this species varied from 4.76 to 3.21 grams per sq m. The production/biomass ratio ranged from 1.42 to 0.81, gradually declining over the period of the study as a result of reduced recruitment which led to a higher proportion of older year-classes in the population. The production of Ampharete ranged from 12.54 grams per sq m to 0.12 grams per sq m, while biomass varied from 2.29 to 0.03 grams per sq m. Although the production and biomass variations were greater for Ampharete than for Nephtys, the production/biomass ratio was more stable for Ampharete, ranging between 5.47 and 4.00. This stability resulted from the fact that Ampharete is an annual species, and production/biomass ratios were therefore not dependent on the balance of year-class strengths as in Nephtys. Settlement success of Ampharete appears to be dependent primarily upon the number of adults reaching maturity at the same site in the previous generation, reflecting an absence of dispersal mechanisms, while the stable biomass and production values for Nephtys may be attributed to its dispersive strategy, successive spawnings, predator escape mechanism, and catholic diet. (Carroll-FRC)
W81-05578

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEVELOPMENT OF NOVEL POROUS SUBSTRATES FOR ULTRAFILTRATION, DESALINATION AND WATER RECLAMATION - PART II,
Gulf South Research Inst., New Orleans, LA. Dept. of Polymer.
I. Cabasso, and B. L. Zimny.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-103920, Price codes: A04 in paper copy, A01 in microfiche. Final report submitted to Office of Water Research Technology, May 5, 1981. 34 p, 21 Fig, 5 Tab, 3 Ref, Append.

Descriptors: *Permselective membranes, *Substrates, *Polymers, *Composite membranes, *Desalination, Reverse osmosis.

Porous, synthetic polymer substrates were developed as support components for composite desalination membranes. The selected material was methyl-brominated poly(bromophenylene oxide), or M-PPO, a hydrophobic polymer readily formulated and cast into large, flat-sheet membranes. Morphological characterization of M-PPO substrates by scanning electron microscope revealed the spongelike matrix structure. Dried substrates could be rewetted by using a wetting agent, e.g., 20 percent acetone in water. Similar M-PPO membranes were previously evaluated in ultrafiltration applications after surface modification with 4-amino-1-naphthalene sulfonic acid sodium salt. Preparation of composite membranes involved deposition of a dense, ultrathin, permselective layer on the porous substrate. Two successful approaches were the in situ polycondensation of two reactive prepolymers to the substrate surface, and the direct application of a dilute polymer solution. Necessary properties of the permselective layer included reactive moieties which would crosslink the substrate surface under mild conditions, and the ability to form a continuous, nonporous film upon drying or curing. Commercially available polysulfone substrates were identically modified for comparison. Membranes were evaluated on a recirculating reverse osmosis rig with NaCl, and in some experiments, chlorine, over periods up to 49 days. (Zimny-GSRI)
W81-05352

3C. Use Of Water Of Impaired Quality

INDUSTRIAL REUSE OF URBAN STORMWATER,
Environmental Protection Agency, Edison, NJ.
R. Field, and C-Y. Fan.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 171-189, February, 1981. 13 Tab, 25 Ref.

Descriptors: *Combined sewer overflows, *Urban runoff, *Storm runoff, Industrial water, Water use, *Water treatment, Costs, Physicochemical treatment, Water reuse, *Impaired water use.

A hypothetical case study is presented which illustrates the cost effectiveness of reclaiming urban stormwater for complete industrial supply. While the quality of urban stormwater varies greatly from metropolitan area to metropolitan area, the biochemical oxygen demand is close to that of secondary treatment plant effluent and the suspended solids concentration is similar to that of raw sanitary wastewater. Because there is high volume variability with stormwater and combined sewer overflow, physical treatment units are generally better than biological ones. A treatment system is designed with the final water quality desired in mind. The sample stormwater reclamation system included a storage reservoir and treatment facilities. Treatment included: fine mesh screening, chemical addition, high rate filtration, disinfection, and carbon columns. A system using a combination of city water and reclaimed stormwater would save approximately $900,000/year over a system using only city water. Reclaimed urban stormwater can be used for industrial subpotable water. (Small-FRC)
W81-05488

THE RESPONSE OF A SOUTHERN APPALACHIAN FOREST TO WASTE WATER IRRIGATION,
Georgia Univ., Athens. School of Forrest Resources.
G. H. Brister, and R. C. Schultz.
Journal of Environmental Quality, Vol 10, No 2, p 148-153, 1981. 3 Fig, 5 Tab, 10 Ref.

Descriptors: *Wastewater irrigation, *Forests, *Wastewater disposal, Secondary treatment, Nutrients, Growth rates, Plant growth, Biomass, Georgia, Appalachian forest.

The role of a mature Appalachian forest in renovating municipal wastewater was investigated in a three year study of the operational land treatment system at Unicoi State Park near Helen, Georgia. The waste water from Unicoi State Park receives the equivalent of secondary treatment in an oxidation lagoon and is chlorinated before being pumped to the disposal site. The area is irrigated one day a week at the rate of 8 mm/hr for a total of 76 mm/day. The water contains no heavy metals. Uptake of some nutrients in the wastewater occurred in the vegetation, but there was no systematic nutrient uptake by any one component of the stand. Overstory trees showed systematic nutrient uptake by any one component of the stand. Overstory trees showed no growth response to the irrigation either in height or diameter. Some increased stem diameter growth was found within the canopy. The irrigation did cause increased diameter in the understory trees. The irrigation decreased the biomass, diversity, and number of individuals of the ground vegetation. The overall result was an increase in biomass in the forest, the magnitude of which is probably limited by the age of the stand. (Small-FRC)
W81-05590

DESIGN AND OPERATION OF CONDENSATE POLISHING AT CEGB FAWLEY,
Central Electricity Generating Board, Southampton (England). Marine Lab.
For primary bibliographic entry see Field 5F.
W81-05635

3D. Conservation In Domestic and Municipal Use

WATER REQUIREMENTS FOR URBAN PLANTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
D. D. Fangmeier, and L. Hogan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-103938, Price codes: A02 in paper copy, A01 in microfiche. Project Completion Report, May, 1981. 7 p, 1 Fig, 3 Tab, 3 Ref.

Descriptors: Water use, *Plant growth, Surface irrigation, *Landscaping, Vegetation, Shrubs, Trees, *Water requirements, Experimental data, Irrigation efficiency, Municipal water, Urban plants, Plant appearance, *Trickle irrigation.

Eighteen species of landscape plants were grown near Tucson, Arizona to evaluate their water requirements and growth. The plants used included ground covers, shrubs and trees. A trickle irrigation system was used to deliver measured quantities of water. Subplots of each species were given high, medium or low water treatments, with medium receiving twice the amount of water and high three times the amount of water of the low treatment. The low water treatment was selected, to produce plant water stress. The measured quan-

tities of water to each species were used to estimate the plant water requirements. The results provide recommended water application for fifteen of the eighteen species. With the exception of privet, no correlation was obtained between growth and water delivered. The irrigation levels selected had minimal effect on plant appearance.
W81-05353

3E. Conservation In Industry

CONTROLLING FINISHING INDUSTRY DISCHARGES,
For primary bibliographic entry see Field 5D.
W81-05636

ELECTROPLATING EFFLUENT CONTROL - PART 1,
For primary bibliographic entry see Field 5D.
W81-05647

3F. Conservation In Agriculture

IRRIGATION SYSTEMS,
G. P. Nortoft.
U.S. Patent No 4,226,366, 8 p, 4 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 139. October 7, 1980.

Descriptors: *Patents, *Irrigation systems, *Application equipment, *Control systems, Irrigation Practices, Irrigation efficiency, Movement.

A field irrigator of the movable type is adapted to move slowly through a long irrigation zone and comprises a rotary water gun mounted on a drive chassis and receives water through a hose from a supply source at one end of the irrigation zone. The irrigator is connected or provided with a control system causing the chassis to move stepwise along the zone and wait at the end of each short step until an irrigation detector, preferably a timer, has registered the attainment of a predetermined irrigation in or along the step. A truly constant irrigation along the entire zone is obtained when the steps are of uniform lengths and the irrigation is set to be the same by each step. A differentiated irrigation along the zone is obtainable when the control system includes a memory unit for storing selective irrigation requirements for the various steps or groups of steps. (Sinha-OEIS)
W81-05421

MULTIPLE VORTEX DRIPPER,
Toro Co., San Marcos, CA. (Assignee).
E. J. Hunter.
U.S. Patent No 4,226,368, 12 p, 14 Fig, 11 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 140. October 7, 1980.

Descriptors: *Patents, *Irrigation systems, *Application equipment, Irrigation efficiency, Irrigation practices, Irrigation operation and maintenance, Flow rate, Water pressure, *Drip irrigation.

A sprinkler head for use in drip irrigation systems is disclosed. Irrigation water entering an inlet is directed through a path comprising pressure dropping chambers before emerging through irrigation tubings connected to outlet openings where the irrigation water emerges at a low pressure drip irrigation flow rate. In the preferred embodiment, the pressure dropping chambers comprise a series of interconnected vortices placed within stacked plates. The entire assembly can be disassembled for cleaning purposes. The assembly further incorporates an integral pressure regulator for performing an initial step decrease in the pressure of the irrigation water before it enters the multiple chambered pressure dropping path. The integral pressure regulator is adjustable and calibrated in gallon per hour flow rates. (Sinha-OEIS)
W81-05422

ECONOMIC IMPACTS OF IRRIGATION TECHNOLOGIES IN THE SEVIER RIVER BASIN,
Utah Water Research Lab., Logan.
T. R. Frickel, and R. Narayanan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231946, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Planning Series UWRL/P-81/02. March, 1981. 54 p, 15 Fig, 24 Tab, 80 Ref.

Descriptors: *Basin irrigation, *Irrigation efficiency, *Computer models, River basins, *Economic analysis, Economic aspects, Irrigation effects, Crop yield, Irrigation practices, Tax rates, Model studies, Water potentials, Environmental effects, Cost-benefit analysis, Sevier River basin, *Utah.

The economic well-being of the semiarid intermountain area requires the efficient use of available water. To improve downstream water quality, federal and state agencies in Utah are offering subsidies and technical assistance to farmers to encourage them to adopt new irrigation technologies that wash fewer salts into the streams. To study the impact of these technological adoptions on the total system, an empirical linear programming model was designed for the Sevier River Basin. In the model, irrigation choices depend on soil types, slopes, crops, and crop yields. Irrigation technologies considered were sprinklers, lined ditches, and pipelines. Institutional constraints included acreage limitations and diversion requirements. Ten scenarios were evaluated. A comparison of four of these shows that optimal adoption of new on-farm irrigation technology in the Sevier River Basin can increase agricultural output by over $3 million through revised cropping patterns of currently irrigated land. The gain in output would be realized by providing or encouraging inter-county transfers of water rights, selective adoption of sprinklers, and irrigation of some new higher-productivity lands. The empirical model examined six counties in terms of eleven USDA-SCS land classifications, eight crops, and four irrigation systems. Future models should incorporate hydrologic routing, hydrosalinity effects, optimal irrigational levels, and year-to-year variation in water availability. (Garrison-Omniplan)
W81-05439

WHEAT ROOT DISTRIBUTION, WATER EXTRACTION PATTERN AND GRAIN YIELD AS INFLUENCED BY TIME AND RATE OF IRRIGATION,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
T. N. Chaudhary, and V. K. Bhatnagar.
Agricultural Water Management, Vol 3, No 2, p 115-124, 1980. 4 Fig, 4 Tab, 12 Ref.

Descriptors: *Irrigation practices, *Crop yield, *Root development, *Wheat, Roots, Soil water, Irrigation water, Water exchange, Available water, Evaporation, Transpiration.

The effect of first irrigation applied 26, 40 or 54 days after seeding and the rate of irrigation (5.5, 7.5 or 9.5 cm) applied subsequently at an irrigation water/pan evaporation ratio of 0.9 on wheat root distribution, grain yield, and water extraction patterns was examined on barrier-free sandy loam soil. When the first irrigation was applied after 26 days, the crop produced a more extensive root system. Crops receiving subsequent irrigation less frequently, but at a heavier rate, developed a deeper root system than the crops receiving frequent, light irrigation. Water extraction patterns corresponded with root distribution patterns, with small differences in root density in the deeper layers producing a greater difference in the water content of the soil than in the upper layers. Although light and frequent irrigations provided maximum grain yields, an early, light irrigation, with subsequent irrigations applied less frequently at a relatively heavier rate was recommended for developing an extensive root system. (Geiger-FRC)
W81-05446

EMITTER DISCHARGE SENSITIVITY TO PRESSURE AND TEMPERATURE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
B. Zur, and S. Tal.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 107, No IR1, p 1-9, March, 1981. 2 Fig, 3 Tab, 4 Ref.

Descriptors: *Temperature effects, *Irrigation design, *Water pressure, Solar radiation, Pressure distribution, Drip irrigation, Sensitivity analysis, Discharge measurement.

Three types of irrigation system emitters (helical long-path, labyrinth, and vortex-type) were tested in the laboratory to measure the discharge sensitivity to pressure and temperature. Discharge sensitivity to pressure varied from 0.43 to 0.86. as expressed by a constant b, depending on flow regime and cross-sectional area for flow in each emitter type. Considerable differences were seen in the three emitter types, and this should be reflected in irrigation system design. Maximum permissible variation in line pressure was 15% for helical long-path emitters, 20% for labyrinth emitters, and 25% for vortex emitters. Discharge sensitivity to temperature increased with line pressure. It was positive for helical long-path emitters, not significant for labyrinth emitters, and negative for vortex emitters. The measured and computed discharge distributions of helical long-path emitters along a 70 meter long pipe exposed to solar radiation were curvilinear. Emitter discharge along the second half of the pipe increased with distance, parallel to the rise in water temperature. For helical long-path emitters the 10% normal variation in discharge should be limited to the first half of the pipe. For vortex emitters a smaller-than-normal line pressure variation is required. For labyrinth-type emitters, temperature variation along the pipe can be neglected. (Cassar-FRC)
W81-05468

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CONSIDERATIONS: PHASE III,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W81-05351

RETENTION BASINS FOR CONTROL OF URBAN STORMWATER QUALITY,
Southeast Michigan Council of Governments, Detroit.
For primary bibliographic entry see Field 5G.
W81-05361

WETLANDS FOR THE CONTROL OF URBAN STORMWATER
Hickok (Eugene A.) and Associates, Inc., Wayzata, MN.
E. A. Hickok.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 79-88, 2 Fig, 4 Tab.

Descriptors: *Urban runoff, *Storm runoff, *Water pollution control, *Wetlands, Water storage, Phosphorus, Pollution load, Suspended solids, Water pollution sources, Wayzata wetland, *Minnesota.

A research project was performed to evaluate and assess urban runoff treatment methods using non-structural wetland techniques in the Wayzata Wet-

land, Minnesota. Over the period studied the wetland water storage was reduced by 3.7 ac-ft of water. Annual phosphorus loads ranged from 0.6 lb/ac/yr from single family dwellings on large lots to 2.1 lb/ac/yr from a shopping center. A total of 134.7 lb/yr of phosphorus entered the wetland, of which 104.1 lb/yr (77%) was retained. Physical entrapment was a major factor in the retention, as 94% of the suspended solids were retained. Surface microbial activity increased when water level management was effective, but activity decreased when soils were submerged and became anaerobic. No adverse environmental impacts on the wildlife or vegetation were detected within the wetland. The development of effective urban runoff control by wetlands as demonstrated in this project was used in the planning of runoff control for a shopping center and an airport, and in the construction of a biologically activated soil filtration unit to filter phosphorus from the hypolimnetic bottom of Wirth Lake in Minneapolis. (Brambley-SRC)
W81-05362

STREAM RESTORATION: PHILOSOPHY AND IMPLEMENTATION,
North Carolina Univ. at Charlotte. Dept. of Geography and Earth Sciences.
N. R. Nunnally.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 89-98, 1 Fig, 2 Tab, 12 Ref.

Descriptors: *Stream stabilization, *Stream erosion, *Channel morphology, *Channel improvement, Design criteria, Environment, Urban areas, Discharge capacity, Bank stabilization, Vegetation, Flow discharge, Charlotte, *North Carolina.

Stream restoration is a process for designing, construction, and maintaining channels which restores the equilibrium conditions found in undisturbed natural channels while improving channel efficiency. It preserves natural stream morphology wherever possible as an attempt to avoid the problems caused by channelization. The design and construction phases of stream restoration projects in Charlotte, North Carolina are described. Channels should be designed to be in equilibrium with existing or expected environmental conditions, so future development in the watershed must be anticipated, and time allowed for equilibrium to be attained. Discharge volume and channel area are determined and used to select the appropriate channel shape and alignment. Correct shaping of the channel is important to maintenance of stable banks. Other bank stabilization measures include preservation of trees, structural protection such as riprap, and vegetative stabilization. (Brambley-SRC)
W81-05363

INVESTIGATION OF CONCRETE GRID PAVEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Architecture and Urban Studies.
G. E. Day.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. 127-136 p, 6 Fig, 2 Tab, 2 Ref.

Descriptors: *Surface runoff, *Runoff coefficient, *Paving, Concrete, *Rainfall-runoff relationships, *Storm runoff, Water quality management, Subsoil, Rainfall intensity, Permeability coefficient, Groundwater recharge.

Concrete grid pavements are used to decrease surface runoff by allowing infiltration and groundwater recharge, but little is known of their hydrological characteristics. Laboratory simulation and testing was conducted on typically installed concrete grid pavements. Five pavements exhibiting different physical characteristics were subjected to rainfall in order to collect runoff data. Coefficients of runoff and lag times are derived based on the following variables: subgrade soil, slope, rainfall intensity, and rainfall duration. The runoff coefficient was lowest with the paver with the lowest percent of bottom open area, suggesting that the coefficient is a function of the surface geometry of the paver. An increase in slope, up to 7% increases the runoff coefficient regardless of paver type, subsoil type, or rainfall intensity. The lower the hydraulic conductivity of the subsoil the higher the runoff coefficient. Runoff coefficients are significantly lower for the concrete grid pavements than for asphalt and concrete. The tentative runoff coefficients can provide the basis for design and implementation of the pavements as an alternative on-site technology within an overall, stormwater management scheme. (Brambley-SRC)
W81-05366

ROLE OF WATER RESEARCH INSTITUTES IN STORMWATER AND EROSION CONTROL,
North Carolina Dept. of Natural Resources and Community Development, Raleigh.
N. S. Grigg, and J. M. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 237-245, 1 Ref, 1 Append.

Descriptors: *Water resources institutes, *Storm water, *Erosion control, *Technology transfer, Urban drainage, Flood control, Water quality control, Storm runoff, Urban runoff, *North Carolina.

Each state has a Water Resources Research Institute. The North Carolina Institute is a particularly active one and has taken an especially strong role in stormwater and erosion control. The basic missions of the water research institutes are water resources research, technology transfer and information dissemination. The North Carolina Institute is well known for its strong program in technology transfer, not only in stormwater but in other water and land related programs as well. The Institute considers that stormwater management is a field which consists of four basic activities: urban drainage, flood control in urban areas, control of erosion, and control of the quality of urban runoff. All of these areas are important and of concern to different groups at different times. There has been a number of research projects supported by the institute of direct interest to workers in stormwater management, and the Institute has conducted several workshops related to stormwater management. Water Research Institutes can be of great benefit in each of the states to work with stormwater management constituencies. The program of the North Carolina Institute is full and complete and has generated considerable interest among local groups concerned with storwater management. (Moore-SRC)
W81-05378

COSTS FOR MANAGING A CONSTRUCTION SITE RUNOFF CONTROL PROGRAM,
CH2M/Hill, Inc., Boise, ID.
For primary bibliographic entry see Field 6C.
W81-05381

MULTIJURISDICTIONAL STORMWATER MANAGEMENT: THE FOUR MILE RUN WATERSHED PROGRAM,
Northern Virginia Planning District Commission, Falls Church, VA.
H. A. Bonuccelli, J. P. Hartigan, Jr., and D. J. Biggers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 267-277, 1 Fig, 9 Ref.

Descriptors: *Computer models, *Storm runoff, *Urban runoff, Stream discharge, Flood control, Model studies, Hydrologic models, Simulation, Flash floods, Jurisdiction, *Virginia, Four Mile Run.

The basinwide streamflow impacts of urbanization in developing watersheds which enclose multiple jurisdictions are seldom evaluated. Local jurisdictions typically possess neither the analytical tools to quantify such impacts nor the institutional mechanisms to address them. The Four Mile Run Watershed stormwater management program has successfully addressed these difficulties by incorporating computer simulation techniques into a regional decision-making process based on the 'joint exercise of powers' institution. The Four Mile Run Watershed encloses portions of two counties and two cities that are located in the Virginia suburbs of Washington, D.C. Periodic flash floods in this area were attributed to the cumulative impacts of sewered urban development in the basin. The continuous simulation model STORM and the single-event model WREM were selected as the watershed planning tools for this program. During the first 30 months of the Watershed Management Program, 223 local drainage modification projects (DMP) were reviewed. In all, 144 local DMP's have been incorporated into the watershed model. The DMP's represent the addition of 54.7 acres of impervious cover and 37 runoff control measures providing a total of 5.6 acre-feet of detention storage. The results of the model assessments to date indicate that, as a result of the activities undertaken so far, the capacity of the flood control channel is not exceeded in any idealized reach, and that projected peak streamflows in the flood control channel have actually decreased. (Moore-SRC)
W81-05382

STORM OVERFLOW BASIN,
W. Ernst, and H. Ernst.
U.S. Patent No 4,225,434, 17 p, 30 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1883-1884. September 30, 1980.

Descriptors: *Patents, *Storm water, *Storm runoff, Equipment, Storm drains, Combined sewers, Urban drainage, Weirs, Overflow, *Storage tanks.

A storm overflow basin for use in combined sewage systems has a storage tank leading to a storm overflow unit having a restricted sewage discharge and a storm overflow. The storm overflow is provided with a weir. A flap gate is mounted to engage the crest of the weir with its bottom edge. It is operable by float controlled means dependent upon the water level in the storm overflow unit to move away from the crest of the weir when storm conditions require a controlled overflow discharge. The normal sewage discharge is provided with restriction means that are also float controlled. (Sinha-OEIS)
W81-05420

WATER HARVESTING BY WAX-TREATED SOIL SURFACES: PROGRESS, PROBLEMS, AND POTENTIAL,
Science and Education Administration, Phoenix, AZ. Water Conservation Lab.
D. H. Fink, G. W. Frasier, and K. R. Cooley.
Agricultural Water Management, Vol 3, No 2, p 125-134, 1980. 2 Fig, 2 Tab, 19 Ref.

Descriptors: *Runoff, *Water supply development, *Water harvesting, Catchment areas, Runoff rates, Range management, Arid lands, Semiarid lands, Water conveyance, Soil surfaces, Precipitation.

Water-harvesting methods may augment the water supplies of semiarid and arid regions. A novel water-harvesting procedure which has been used at the Granite Reef (Arizona) test site involves the application of paraffin wax to soils to form a water-repellent catchment surface. In 1972, an average of 0.07 kilograms/sq m of ground paraffin wax was applied to smooth, rain-compacted soils of the test area. The wax was melted into the soil by the sun. The two catchment sites are still in

operation with an average runoff efficiency of 87% over a 7-yr period. Year 7 averages were 85%, only 2% less than the 7-year average. The 7-year runoff efficiency was only 10% less than that of a plastic membrane, but proved four times greater than that of a smoothed, cleared soil surface, and almost six times greater than that of a small untreated natural desert watershed. Wax-treated catchments are being used to supply water to livestock in arid rangelands. Field and laboratory studies show that wax treatment works best on sandy soils containing less than 20-25% clay plus fine silt. (Geiger-FRC)
W81-05447

CONSERVATION V. LAND DRAINAGE--A GUIDE FOR THE FUTURE,
S. Lucas.
Water, No 34, p 7-10, September, 1980.

Descriptors: *Land reclamation, *Drainage engineering, *Wildlife conservation, Conservation, *Wetlands, *Great Britain, Land use, Drainage, Planning, Project planning, Agriculture.

There has been a great deal of conflict among conservationists, water authorities, and farmers and other land developers over the drainage of wetland areas in Great Britain. The Water Space Amenity Commission has published conservation and land drainage guidelines which are designed to help lessen the impact of land drainage schemes on the environment and conservation interests. The guidelines include advisory notes; practice notes covering sea defense works, fens and coastal marshes, and rural, lowland, urban, and hill areas; and appendices presenting information on applicable laws, nature conservation, landscape, water recreation, fisheries, historic conservation, agriculture, grants and contributions, and economic considerations. Topics covered by the guidelines include discussion of when consultation should be initiated and with whom; aspects of conservation, landscape and amenity, fisheries, and recreation interests which should be considered; and methods of designing land drainage schemes to achieve minimum impact on the environment or habitat of local flora and fauna. The guidelines are addressed both to the local drainage engineer who will implement schemes and the persons planning and making decisions with respect to land drainage activities. The guidelines recommend a regional, voluntary approach to consultation on such projects. Further research is recommended in such areas as biotechnical engineering, restoration of landscape after land drainage projects, and conservation techniques. Training should be provided for operators, supervisors, and professional personnel. (Carroll-FRC)
W81-05690

4C. Effects On Water Of Man's Non-Water Activities

URBAN RUNOFF RECEIVING WATER IMPACTS: PROGRAM OVERVIEW,
Municipal Environmental Research Lab., Edison, NJ. Storm and Combined Sewer Section.
R. Field, and R. Turkeltaub.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 83-100, February, 1981. 11 Fig, 4 Tab, 20 Ref.

Descriptors: *Dissolved oxygen, *Storm runoff, *Urban runoff, Water pollution sources, *Pollution load, Heavy metals, Particulate matter, Combined sewer overflows.

The Storm and Combined Sewer Program of the Environmental Protection Agency has a receiving water impacts subprogram to develop control methodologies. The program has had only partial success when using the conventional dissolved oxygen parameter to determine urban stormwater impacts. There is a problem with the application of conventional dry-weather monitoring to unsteady-state storm flow regimes. Further research is needed to resolve the anomaly between actual runoff loadings and observed receiving water impacts. Milwaukee River sediment analysis revealed that a disturbed benthos depletes dissolved oxygen from the overlying waters. Particulate matter storm runoff is heavier and larger than treated sanitary effluent particles and can cause toxic enrichment and thus biological upsets. Urban runoff has been identified as a source of heavy metals and petroleum hydrocarbons. With a view towards control, a receiving water model was constructed for preliminary planning and screening of area wastewater treatment alternatives in terms of frequency of water quality violations. (Small-FRC)
W81-05534

METHODS OF CONFINING OIL IN UNLINED CAVERNS IN AQUIFERS: WATER TABLE MAINTENANCE BY WELL RECHARGE,
Royal Inst. of Tech., Stockholm (Sweden).
R. Thunvik, and C. Braester.
Water Resources Research, Vol 17, No 1, p 228-232, February, 1981. 9 Fig, 4 Ref.

Descriptors: *Oil, *Underground storage, Wells, Injection wells, Recharge wells, Aquifers, *Oil-water interfaces.

Storage of surplus or emergency supplies of oil in underground aquifers has been increasingly investigated in the light of recent oil crises. One method employed particularly in Sweden calls for the storage of oil in an unlined cavern located below the groundwater table. The water pressure in the surrounding aquifer exceeds the oil pressure in the cavern. One major problem is maintenance of the water table at a prescribed level to prevent migration of oil. Mathematical studies have indicated that the rate of flow of water into the cavern increases approximately linearly with the depth of the cavern roof below the constant level in the injection wells. A minimum of water influx is essential. Low flow rates can be obtained by locating the cavern roof at a depth close to the constant level in the injection wells and locating the injection wells far from the caverns. The requirements are just the opposite for maintaining the phreatic surface above the oil level in the cavern. The wells should be close to the cavern, and the depth of the cavern roof should be large relative to the constant water level in the injection wells. (Baker-FRC)
W81-05538

CONVERGING FLOW MODEL APPLIED TO URBAN CATCHMENT,
CH2M Hill, Reston, VA.
F. W. Ellis, F. V. Ramsey, and G. M. Hornberger.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 106, No HY9, p 1457-1470, September, 1980. 9 Fig, 3 Tab, 15 Ref.

Descriptors: *Urban runoff, *Catchment areas, Hydrograph, Drainage, Watersheds, Runoff, Catchment basins, Basins, *Model studies, Storm sewers, Storm drains, Sewers, Flow, Detention reservoirs, *Storm runoff, *Overland flow.

The utility of a converging overland flow kinematic wave model in simulating storm hydrographs on an urbanized catchment was examined. A major part of the effort concerned developement of appropriate schemes to calculate excess precipitation, that is, investigation and improvement of various methods of determining abstractions from gross precipitation. A model was developed and applied to the Rock Creek Watershed, which is located in Maryland northwest of Washington, D.C. The analysis showed that the coverging overland flow model can be readily applied to urbanized watersheds. It is easily calibrated and gives reasonable predictions for hydrograph shape as well as peak flow. The major problem in application of the model to an urbanized area is the choice of an algorithm for determining excess precipitation. A standard infiltration equation with 'reasonable' parameter values was not suitable for representing the abstraction rate curve, as infiltration per se decreased too slowly during the initial stages of a runoff event to explain observed runoff trends. A generalization of Philip's equation can be used to predict abstraction rates. In the Rock Creek Watershed a simple scheme for determining abstraction based on a linear regression between direct runoff and gross precipitation proved most satisfactory from a predictive standpoint. The model in question could not only be useful for predicting flows for the design of storm sewers, detention ponds, and other structural aspects, but would also provide estimates of runoff quantity necessary to implement washoff models for determining nonpoint source pollution. (Baker-FRC)
W81-05587

4D. Watershed Protection

LAND USE SHIFTS AND A QUALITY ENVIRONMENT,
Soil Conservation Service, Washington DC.
N. A. Berg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 9-25.

Descriptors: *Land use, *Urban runoff, *Water quality control, *Sediment control, *Erosion control, Urban areas, Legislation, Economic aspects, Soil conservation, Public participation.

The efforts of the Soil Conservation Service in sediment control and water quality in urbanizing areas are reviewed briefly and future developments are suggested. Some 20 states have legislation designed to control erosion and sedimentation; all states are affected and therefore need a legislative program. Land use planning should be conducted by local officials to develop the most appropriate sites. Erosion and sediment control techniques need to be cost effective. Communities and their citizens need to become aware of the problems and the means of solving them. Specific educational projects should be directed to contractors, developers, and inspectors. Builders and developers should be encouraged to adopt and follow a code which promotes urban land conservation and reduces erosion and sedimentation. Erosion may be controlled by mulching, grading, diversions, grade stabilization, grassed waterways, and storm sewers. Sediment may be controlled by vegetative filters, sediment traps, and sedimentation basins. Runoff may be controlled by ponds, infilitration trenches, perforated parking lots, and above or below ground storage. (Brambley-SRC)
W81-05356

THE ROLE OF CONSERVATION DISTRICTS IN URBAN EROSION AND SEDIMENT CONTROL,
National Association of Conservation Districts, Harper, KS.
L. Bauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 27-33.

Descriptors: *Soil conservation, *Erosion control, *Sediment control, *Water pollution control, Nonpoint pollution sources, Resources management, Land reclamation, Forest management, Education, Land use, Decision making, Urban planning, Cost sharing, Financing.

The development and activities of Soil Conservation Districts are reviewed briefly. There are now 2950 districts covering over 99% of the nation. District programs focus on the prevention of soil erosion and the control of water pollution. The National Association of Conservation Districts has identified eight priority areas for district programs: protection of the resource base and prevention and control of nonpoint source pollution; comprehensive resource management on a watershed basis;

reclamation of mining areas; improvement in the management of private, nonindustrial forest lands; promotion of environmental education; preservation and enhancement of prime agricultural, range, pasture, forest and horticultural lands; participation in the land-use decision process; and reclamation of areas distributed by urbanizing and industrial development. There is concern that the voluntary nature of the programs will be adversely affected by the regulatory approaches taken by federal agencies. Other areas of concern include whether the cost-sharing enjoyed by farmers should be extended to builders and construction firms, financing for technical assistance, and development of trust and cooperation among the districts, governments and private individuals involved in the programs. (Brambley-SRC)
W81-05357

THE ROLE OF REGULATION IN URBAN EROSION AND SEDIMENT CONTROL,
Illinois Inst. of Natural Resources, Chicago.
For primary bibliographic entry see Field 6E.
W81-05358

URBAN EROSION,
Minnesota State Senate, St. Paul.
G. Willet.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 51-56.

Descriptors: *Sediment control, *Erosion control, *Construction, *Legislation, Regulations, Jurisdiction, Storm runoff, Urban runoff, Public participation, Water pollution control,.

Sediment is the highest volume water pollutant, of which 70% results from human activity, with the remainder resulting from natural erosion. Construction contributes sediment in much greater proportion than its land resource use, so that sediment dose is heavily concentrated, and it also carries pollutants with it. Private and public construction, road, street, highway and bridge construction, and streambank erosion are all sources of sediment, and under current Minnesota laws and regulations erosion control is exercised by many federal, state and local departments, agencies and governmental units. Voluntary local control has not proved effective; over half of the metropolitan area municipalities have no erosion and sediment control ordinances or comprehensive stormwater control plans. Legislation has been introduced for the development of state local erosion and sediment control regulations. The legislation must be flexible to accomodate local needs while maintaining a consistent statewide standard, and be preceded by sufficient public education and hearings to gain acceptance. (Brambley-SRC)
W81-05359

PRESENT URBAN EROSION CONTROL TECHNIQUES,
Soil Conservation Service, Washington, DC. Engineering Div.
R. E. Highfill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 57-67, 18 Ref, 1 Append.

Descriptors: *Urban runoff, *Erosion control, *Sediment control, *Construction, *Urban planning, Vegetation, Waterways, Storm sewers, Sedimentation basins.

The observed increases in stormwater runoff, erosion, and sediment yield from untreated construction sites can be reduced by planning and carrying out an effective erosion control program. Early planning is used to locate structures and roads, retain existing vegetation, and minimize earthmoving to reduce erosion. Appropriate construction of temporary measures and final vegetation, all reduce erosion and runoff problems. Erosion prevention is preferable to sediment control. Erosion reduction can be achieved by proper location of access routes, vegetating or mulching surfaces, land grading, use of grassed or lined waterways, appropriate storm sewers and grade stabilization structures, and subsurface drains. Sediment may be trapped by straw bale dikes or vegetative filters, and sediment basins, which can remove 80% and 90% of sediments, respectively. Runoff management systems include such practices as dams, excavated ponds, infiltration trenches, perforated parking lots, parking lot storage, rooftop storage, and underground tanks. All the control practices will be enhanced by development of government policies, public awareness, and education of individual contractors and construction workers. (Brambley-SRC)
W81-05360

METHODS FOR CONTROLLING EROSION AND SEDIMENTATION FROM RESIDENTIAL CONSTRUCTION ACTIVITIES,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W81-05364

COST EFFECTIVE ANALYSIS OF CONSTRUCTION EROSION CONTROL AND IMPLICATIONS FOR PLANNING IN SOUTHEASTERN WISCONSIN,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
D. B. Kendziorski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 107-118, 8 Fig, 2 Tab, 5 Ref.

Descriptors: *Erosion control, *Construction, *Cost analysis, *Water pollution control, Water quality management, Phosphorus, Pollution load, Nonpoint pollution sources, Sediment control.

A cost-effectiveness comparison of construction erosion control and other methods of water pollution abatement, is presented, with a discussion of the importance of construction erosion and its control in the context of an areawide water quality management plan. The unit cost of phosphorus load reduction of 90% was calculated to be $2,600/acre for construction erosion control; the figure is considered to be high. It is estimated that construction activities contribute about 15% of the total phosphorus load of nonpoint pollution, and will take about 45% of the control costs. The cost of controlling one pound of phosphorus from construction sources was estimated to be $31, when costs ranged from $22-562 per pound of phosphorus for livestock waste control and intensive urban nonpoint source control. Construction erosion control will reduce sediment and phosphorus loading, and is a cost-effective means of reducing them. If such control is not implemented many lakes and rivers in Wisconsin will suffer declining water quality, to the point that they would not meet 'fishable-swimmable' standards. The Southeastern Wisconsin Regional Planning Commission has recommended that formal construction erosion control regulatory programs be implemented by the appropriate local agencies. (Brambley-SRC)
W81-05365

EROSION AND SEDIMENT CONTROL REGULATORY LAWS -- EVOLUTION AND CURRENT STATUS,
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 6E.
W81-05367

EROSION CONTROL IN A SUBURBANIZING AREA: THE CASE OF MIDDLETON, WISCONSIN,
Middleton City Planning Commission, Wisconsin.
For primary bibliographic entry see Field 6E.
W81-05368

DEVELOPMENT OF COMPREHENSIVE EROSION CONTROL AND STORMWATER MANAGEMENT ORDINANCES IN DANE COUNTY, WISCONSIN,
Minnesota State Water Planning Board, St. Paul.
For primary bibliographic entry see Field 6E.
W81-05369

THE DEVELOPMENT OF EROSION AND SEDIMENT CONTROL ORDINANCES IN THE CINCINNATI AREA,
Soil Conservation Service, Cincinatti, OH.
G. A. Cummings.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 177-186, 2 Append.

Descriptors: *Ordinances, *Erosion control, *Sediment control, *Construction, *Landslides, Urban areas, Training, Slope stability, Drainage, *Cincinnati area, Ohio.

A series of landslides in 1973 and 1974 provided the impetus for Cincinnati and its suburbs to enact sedimentation and erosion control ordinances. The ordinances were developed prior to a new soil survey of the district which will identify critical slide prone soils. Orderly development within Hamilton County may then be planned. Training of city employees is required, so that they may select the proper erosion control practices and inspect their installation. Enforcement of the provisions of the ordinances is aided by the use of checklists of actions to be taken by each developer or engineer. The focus of the ordinances is to maintain slopes in a stable condition, ensure safe loads on slopes, and maintain adequate drainage on the site and adjacent sites, and prevent ponding of water, erosion, and sedimentation. Plans must show the measures, temporary and permanent, which will be taken to comply with the ordinances and the timing of each action. (Brambley-SRC)
W81-05370

EROSION CONTROL AND STORM WATER MANAGEMENT FOR URBAN SOIL SEDIMENT POLLUTION ABATEMENT, A WORKABLE OHIO STANDARD,
Ohio Dept. of Natural Resources, Columbus.
R. L. Goettemoeller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 191-198. 1 Tab.

Descriptors: *Erosion control, *Storm runoff, *Construction, *Urban runoff, *Sediment control, Water pollution control, Standards, Runoff rates, Flow rates, Landslides, *Ohio.

Soil erosion on urban development construction sites and uncontrolled accelerated storm water runoff from developed urban areas are the roots of urban soil sediment pollution. In Ohio, standards to address urban sediment pollution are expressed in terms of a level of conservation or management to be applied in conjunction with earth grading, filling, excavating, or other earth disturbance on development areas rather than a level of water quality expected. There are separate standards for development site erosion and offsite stream channel and flood plain erosion resulting from accelerated storm water runoff. The peak rates of runoff from developed areas shall be no greater than those

before development, or if it is greater, the runoff from any storm event must be reduced to the rate from a one-year 24 h storm under undeveloped conditions. These levels were chosen to have runoff occur at less than bankfull flow, and to limit the downstream effects. Storm water runoff peaks may be controlled by: retarding flow velocity by increasing friction; grading; induced infiltration; and detention and retention. Ohio also has a standard prohibiting dumping of earth material into public waters, or close enough so that it may move into the water, and which requires preliminary planning and work to prevent landslides. (Brambley-SRC)
W81-05371

THE ROLE OF THE FRONTIER CONSERVATION DISTRICT IN EFFECTIVE EROSION AND SEDIMENTATION CONTROL DURING DEVELOPMENT,
Frontier Conservation District, Cheyenne, WY.
N. Holmes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 199-202.

Descriptors: *Erosion control, *Sediment control, *Construction, Soil surveys, Land use, Planning, Wind erosion, Public relations, Soil erosion, *Wyoming.

The Frontier Conservation District was organized in the mid 1960's primarily to help the ranching and farming community prevent and reduce erosion on grazing and farm lands, and this concern was extended to include the development community. The planning office and later individual developers were given free information and help on soil erosion and sedimentation. More detailed soil surveys were conducted so that the district became the source of the soil, terrain, and land use data for the Laramie County land use plan. District staff review plats for soil and surface water suitabilities and hazards and assist in development designs. A pamphlet has been produced to encourage the maintenance of grass cover on lots to reduce wind erosion. Public outreach has included presentation of a slide show demonstrating the problems of erosion and sedimentation during development, and annual meetings with state legislators and county commissioners. A level of understanding has been achieved in that developers now recognize that it is cheaper to design out all immediate and future erosion problems, rather than deal with them later. (Brambley-SRC)
W81-05372

SELF-REGULATION, ALTERNATIVE TO LEGISLATION, WAUKESHA COUNTY, WISCONSIN,
Waukesha County Park and Planning Commission, WI.
R. L. Mace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report 905/9-80-002, January, 1980. p 203-208.

Descriptors: *Construction, *Urban runoff, *Erosion control, *Sediment control, Storm runoff, Runoff, Soil erosion, Ordinances, Drainage, Waukeska County, *Wisconsin.

The Waukesha County Soil and Water Conservation District, in March 1977, adopted a number of guidelines and objectives. One of these objectives to promote and encourage the development of drainage and resource plans prepared by developers for new developments and to encourage adoption of ordinances regarding drainage plans. Another objective was to develop a set of guidelines for developers to use in preparing a conservation plan for subdivisions. A third objective was to promote, encourage and provide technical assistance in the development and maintenance of roadside ditches. An ordinance has not been adopted specifically to effectuate the requirements for drainage and erosion control plans, but even in the absence of such an ordinance, the program has been successful. Since the formulation of the objectives, the Park and Planning Commission has required the preparation of drainage and erosion control plans to be prepared by subdivision developers for review. The district has adopted the Soil Conservation Service Technical Guide as the districts' standards and specifications. All subdivision plats in the county, except those where storm sewers are provided, are reviewed on the basis of the Technical Guide. Because of the lack of a specific ordinance, there are still a few engineers and surveyors who are not cooperating, but most recognize the need to provide for erosion and sediment control. (Moore-SRC)
W81-05373

NON-AGRICULTURAL EROSION CONTROL IN IOWA,
Iowa Dept. of Soil Conservation, Des Moines.
For primary bibliographic entry see Field 6E.
W81-05374

COMPREHENSIVE COMMUNITY PLANNING AS A PROMISING EROSION CONTROL IMPLEMENTATION TECHNIQUE,
Metropolitan Council, St. Paul, MN.
G. Oberts, and M. Jouseau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 217-226.

Descriptors: *Comprehensive planning, *Erosion control, *Storm runoff, *Watershed management, Water quality control, Urban planning, Community development, Soil erosion, Urban runoff, *Minnesota, Twin Cities, Metropolitan Area.

Like many major urban centers, the seven-county Twin Cities Metropolitan Area in Minnesota has experienced extensive suburban growth and urban redevelopment in the last 20 years. Two surveys were conducted within the Metropolitan Area to determine the methods, if any, used to control erosion and stormwater runoff. Results showed that most communities do not have erosion controls and relatively few look beyond the immediate future in stormwater management. All the governmental units surveyed have adequate authorities to deal with erosion and stormwater management through community-wide planning and the implementation of controls, but few have exercised these authorities. Those communities that examine their resources and plan long-term growth are the ones that develop logical and effective programs to control soil erosion. To be effective, communities should inventory their resources, quantify their problems, and integrate this knowledge into a plan and implementation program. Agencies such as soil and water conservation districts or watershed districts can assist a community, but it is the community that must be dedicated to soil conservation and natural resource preservation if environmental damage is to be avoided. Finally, the key to an effective soil erosion program is a vigorous implementation approach that includes follow-up inspections. (Moore-SRC)
W81-05376

ROLE OF WATER RESEARCH INSTITUTES IN STORMWATER AND EROSION CONTROL,
North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 4A.
W81-05378

CONSIDERATIONS FOR THE DEVELOPMENT OF URBAN EROSION CONTROL ORDINANCES,
North Carolina Department of Natural Resources and Community Development, Raleigh. Div. of Land Resources.
For primary bibliographic entry see Field 6E.
W81-05379

URBAN EROSION AND SEDIMENT CONTROL: METROPOLITAN TORONTO,
Metropolitan Toronto and Region Conservation Authority (Ontario). Water Resources Div.
A. Sahabandu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 279-290.

Descriptors: *Urban runoff, *Erosion control, *Sediment control, *Construction, Storm runoff, Vegetation, Urban drainage, Stream erosion, *Toronto, Canada.

The river valleys are one of the most beautiful parts of Metropolitan Toronto, Canada, but with a rapidly expanding populace there exists a heavy demand for development of the valley system. The significance of this general process is magnified by the increasing pressures for the use of land within and abutting erosion susceptible areas. Man-made problems now requiring remedial action in Metropolitan Toronto include: inadequate setbacks, fill problems, stormwater management, destruction of vegetation, and the inadequate planning and design of structures. The protective and preventive program is directed towards achieving the following objectives: remedial work for the control of erosion in the primary watercourses; a program of sediment reduction through on-stream erosion control work and off-stream planting programs; recognize the importance of retaining the natural valley character in the design of remedial work; establish regulatory control over development in areas susceptible to erosion; provide advice to municipalities and landowners in order to achieve reasonable control of sediment generation; cooperate in the planning and design of urban drainage systems; and update and augment the current state of the art regarding erosion and sediment control in the jurisdiction. (Moore-SRC)
W81-05383

EROSION AND RUNOFF CONTROL IN NORTHWESTERN COLORADO,
Northwest Colorado Council of Governments, Frisco.
T. L. Elmore, and G. E. Dahl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 291-300, 3 Fig.

Descriptors: *Runoff, *Erosion control, *Water quality control, *Construction, Planning, Land use, Urban runoff, Regulations, Storm runoff, Groundwater, Vegetation, *Colorado.

The Northwest Colorado Council of Governments (NWCCOG) includes six counties in the mountainous area of Colorado west of Denver. The combined effect of tourism and the energy industry have created strong development pressures in the region. The scarcity of land is forcing development into stream environment zones, eliminating wetlands, and creating flood hazards. In 1975, NWCCOG received planning agency designation under Section 208 of the Clean Water Act. The challenge for this program was to develop a system of controls which would protect existing high water quality, establish uniform controls, minimize new regulatory obstacles for developers, and minimize new staff requirements for small local governments. The key to the regulatory program is tying together existing regulatory programs to effectively deal with the problem. These

programs include subdivision and land use codes, floodplain regulations, Clean Water Act point source permits, and Clean Water Act dredge and fill permits. Developers are alerted early in the planning stages to potential requirements under this regulatory program, so that project siting can be arranged to eliminate onerous requirements, or to make compliance less complicated. The NWCCOG Water Quality Plan outlines policies and guidelines for: surface and groundwater encroachment; vegetation disturbance; soil disturbance and earth movement; impervious cover; and storm water. (Moore-SRC)
W81-05384

NEW RESPONSIBILITIES IN URBAN EROSION AND SEDIMENT CONTROL; THE MARYLAND EXPERIENCE,
Soil Conservation Service, College Park, MD.
H. E. Scholl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 309-317.

Descriptors: *Urban runoff, *Erosion control, *Sediment control, *Construction, Soil erosion, Storm runoff, Education, Regulations, *Maryland.

Under Maryland's Sediment Control Law, counties and municipalities are required to develop a sediment control program and the procedures and ordinances necessary to implement and enforce it. No grading or building permit may be issued until the developer submits a grading and sediment control plan. There are seven important technical principles for control of erosion and sediment upon which technical standards and assistance are based: exposed the smallest practical area of land; expose for the shortest time possible; temporarily stabilize critical areas with vegetation or mulch; install and maintain sediment traps; accommodate increased runoff; establish permanent vegetation and structures as soon as possible; and fit the development plan to the topography and soils. Soil Conservation Districts (SCD) provide assistance during each stage of development, including the land acquisition stage, preliminary planning stage, preconstruction stage and construction stage, and also provide information, education and evaluation. The Maryland program continues to be innovative and evolving. For example, stormwater management is becoming a new and important part of the program. It is now required in more than 10 counties by SCD policy, county executive order or ordinance. (Moore-SRC)
W81-05385

THE VIRGINIA EROSION AND SEDIMENT CONTROL PROGRAM,
Virginia Soil and Water Conservation Commission, Richmond.
G. Seeley, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 319-325.

Descriptors: *Urban runoff, *Erosion control, *Sediment control, *Construction, Education, Legal aspects, Economic aspects, Soil erosion, Training, *Virginia.

A 1973 state law mandated that every county, city and town in Virginia be covered by an approved local erosion and sediment control program. Consequently, there are 172 separate local programs, most of which are administered by local governments. The state law did not provide any funding for local programs, although the law was amended in 1978 to allow localities to charge a fee for reviewing plans and conducting inspections. Many jurisdictions have chosen not to charge any fee at all. A pervasive problem is the shortage of people who are qualified in the field of soil and water conservation, and more specifically in the field of urban conservation. One of the primary objectives of the Virginia Soil and Water Conservation Commission is to establish a statewide education program which will make erosion and sediment control training available to those who need it, through community college courses, and statewide training seminars. Local program reviews and improved technical publications have also been used to assist local officials and others involved in erosion and sediment control. A quarterly newsletter is published to establish a communication link between the Commission and persons who are affected by the law. (Moore-SRC)
W81-05386

THE NEW JERSEY EXPERIENCE IN CONTROL OF URBAN SOIL EROSION AND SEDIMENTATION,
New Jersey Dept. of Agriculture, Trenton. Soil and Water Conservation Service.
For primary bibliographic entry see Field 6E.
W81-05387

GEORGIA'S APPROACH TO URBAN EROSION AND SEDIMENT CONTROL,
Georgia Soil and Water Conservation Committee, Athens.
For primary bibliographic entry see Field 6E.
W81-05388

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ADSORPTION OF TRACE METALS DURING FILTRATION OF POTABLE WATER SAMPLES, WITH PARTICULAR REFERENCE TO THE DETERMINATION OF FILTRABLE LEAD CONCENTRATION,
Water Research Center, Marlow (England).
M. J. Gardner, and D. T. E. Hunt.
Analyst, Vol 106, No 1261, p 471-474, April, 1981. 3 Fig, 1 Tab, 2 Ref.

Descriptors: *Lead, *Drinking water, Potable water, Chemical analysis, Water analysis, *Trace metals, Pollutant identification.

This paper describes the assessment of adsorptive losses of lead during filtration using two commercially available filtration systems. Synthetic solutions and spiked samples were used, as these allowed comparison of adsorption at one lead level. Adsorptive lead losses were observed when synthetic solutions at various pH values were passed through the two types of apparatus without a filter membrane being fitted. Losses to the polycarbonate system were always below 10% and in many tests were not statistically significant. In contrast, very large losses (greater than 80% at high pH values) were noted with the glass apparatus. The presence of calcium in the filtered solution caused a reduction in adsorptive lead loss from synthetic solutions, possible by competitive adsorption. It is noted, however, that pretreatment of the sample with calcium solution may cause desorption of lead from particulate matter in the sample, and it is therefore not recommended as a routine practice. Rinsing the filtration system with the sample may produce a worthwhile reduction in adsorptive lead loss and is a preferred pretreatment. (Baker-FRC)
W81-05448

IDENTIFICATION, DISTRIBUTION, AND TOXIGENICITY OF OBLIGATE ANAEROBES IN POLLUTED WATERS,
Naval Medical Research Inst., Bethesda, MD.
O. P. Daily, S. W. Joseph, J. D. Gillmore, R. R. Colwell, and R. J. Seidler.
Applied and Environmental Microbiology, Vol 41, No 4, p 1074-1077, April, 1981. 1 Fig, 2 Tab, 18 Ref.

Descriptors: *Pollutant identification, *Bacterial analysis, *Anaerobic bacteria, Clostridium, Seasonal variation, Human diseases, Isolation, Separation techniques, Human pathology, Toxicity, Water pollution effects, Water pollution, Rivers, Seawater.

A diver training site was sampled periodically for obligate anaerobic microorganisms, which have been identifed as the causative agents of many infectious diseases. Water and sediment samples from the Anacostia River, Washington, D. C., were diluted and analyzed for obligate and facultative anaerobes using supplemented anaerobic brain heart infusion agar. Obligate anaerobes were identified by Gram-stain, morphology and gas-liquid chromatography of metabolic by-products and the Minitek anaerobic identification scheme. The number of anaerobes varied from 1,800 cells/ml in the warmer months to 10 cells/ml in winter. Seawater from Jamaica Bay and the New York Bight were analyzed for comparison. The obligate anaerobic population of the river ranged from 2-10% of the total anaerobic count (TAC). The TAC of water samples from the New York Bight ranged from 1,000 to 10,000 cells/milliliter. TAC and obligate anaerobic counts were higher in sediment than in water samples. A seasonal occurrence of obligately anaerobic bacteria, predominantly Bacteroides and Clostridium, was observed. Several of the isolates proved toxigenic in adrenal cell assays, suggesting a possible health hazard to divers using these polluted waters. (Geiger-FRC)
W81-05451

COLIFORM SPECIES RECOVERED FROM UNTREATED SURFACE WATER AND DRINKING WATER BY THE MEMBRANE FILTER, STANDARD, AND MODIFIED MOST-PROBABLE-NUMBER TECHNIQUES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
T. M. Evans, M. W. LeChevallier, C. E. Waarvick, and R. J. Seidler.
Applied and Environmental Microbiology, Vol 41, No 3, p 657-663, March, 1981. 3 Tab, 24 Ref.

Descriptors: *Coliforms, *Bacteria, *E. coli, *Water analysis, *Pollutant identification, Analytical techniques, Microbiology, Microorganisms, Enteric bacteria, Sewage bacteria, Water quality, Potable water, Surface water, Effluents.

Each of three coliform detection techniques was selective for a different profile of coliform species from drinking water and untreated surface water samples. The membrane filter (MF), standard most probable number (S-MPN) and modified most probable number (M-MPN) methods were compared using 11 coliform species. Citrobacter freundii was common in most samples. Recovery of this species was as follows: untreated surface water--MF, 34.1%; S-MPN, 9.0-10.8%; M-MPN, 18.9-21.1%; drinking water--MF, 79.3%; S-MPN, 61.0-75.0%; M-MPN, 61.4-63.4%. E. coli data was: untreated surface water--MF, 28.2%; S-MPN, 39.2-52.3%; M-MPN, 25.5-36.1%; drinking water--MF, 4.3%; S-MPN, 7.5-9.8%, M-MPN, 3.2-10.4%. Klebsiella data was: untreated surface water--MF, 13.9%; S-MPN, 24.3-30.4%; M-MPN, 17.2-20.6%; drinking water-MF, 2.4%; S-MPN, 5.0-7.3%; M-MPN, 8.9-9.0%. Selection of a method can produce underestimates according to the different species predominant in the different types of waters (raw sewage, sewage effluent, creeks, and chlorinated drinking water), leading to classification of contaminated waters as potable. As new coliform detection techniques are developed, the selection profiles they produce should be considered. (Cassar-FRC)
W81-05454

EVALUATION OF EXISTING METHODS FOR QUANTITATION OF POLYCHLORINATED BIPHENYLS IN ENVIRONMENTAL SAMPLES AND SUGGESTIONS FOR AN IMPROVED METHOD BASED ON MEASUREMENT OF INDIVIDUAL COMPONENTS,
Nederlands Inst. voor Onderzoek der Zee, Texel.
J. C. Duinker, M. T. J. Hillebrand, K. H. Palmork, and S. Wilhelmsen.

Bulletin of Environmental Contamination and Toxicology, Vol 25, No 6, p 956-964, 1980. 4 Fig, 2 Tab, 11 Ref.

Descriptors: *Polychlorinated biphenyls, *Water analysis, *Organic compounds, *Pollutant identification, Chlorinated hydrocarbons, Chromatography, Aroclors, Chemical analysis, Seawater.

Two approaches for determination of polychlorinated biphenyls (PCB) in environmental samples have been described in the literature quantitation in terms of technical formulation equivalents and quantitation after perchlorination. In the first method chromatographic peaks are compared with known commercial formulations such as the Aroclor series and Clophen A50. There are many difficulties in matching peaks of unknowns with those of the complex technical formulations. In the second approach PCB components are perchlorinated so that only one peak, decachlorobiphenyl, results. Although a simple chromatogram is produced, no information is available on the degree of chlorination of the original mixture. At low concentrations in water, contaminants in the chlorinating agent SbC15 produce high blanks. In addition, biphenyl and other compounds are also perchlorinated and interfere seriously with accuracy. An improved PCB quantitative method is the temperature programmed capillary electron capture detector-gas chromatography, which produces much better resolution of PCB's in extremely low levels in ocean water. Concentrations of PCB's (tetra, penta, and hexa) detected by the temperature programmed capillary method ranged from 0.009 to 0.052 nanograms per liter. (Cassar-FRC)
W81-05455

DETERMINATION OF BENZO(A)PYRENE, HEXACHLOROBENZENE AND PENTACHLOROPHENOL IN OYSTERS FROM GALVESTON BAY, TEXAS,

Texas A and M Univ., College Station. Dept. of Chemistry.
H. E. Murray, G. S. Neff, Y. Hrung, and C. S. Giam.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 663-667, October, 1980. 1 Tab, 18 Ref.

Descriptors: *Aromatic compounds, *Oysters, *Chemical analysis, Water pollution sources, Gas chromatography, Benzpyrene, Hexachlorobenzene, Pentachlorophenol, *Galveston Bay, Texas, Organic compounds, Coastal waters, Industrial wastes, Estuaries.

Oysters from Galveston Bay, Texas, were surveyed for organic pollutant content. Oysters were collected in May near Morgan's Point at the lower end of the Houston Ship Channel, the site of intensive industrial plant development and potential for discharge of refractory organics to the Galveston Bay estuarine system. The specimens were transported to the laboratory in dry ice. Tissues were extracted and analyzed by gas chromatography with a nickel detector for hexachlorobenzene (HCB) and pentachlorophenol (PCP), selected as representative organic pollutants from the polycyloraromatic compound and chlorinated phenol classes. The polycyclic aromatic hydrocarbon, benzo(a)pyrene, was investigated by liquid chromatography in conjunction with a spectrophotometer. Residue levels of HCB were 0.31-1.37 ng/g, mean 0.63 plus or minus 0.39 ppb. PCP levels ranged from 3.4 to 8.3 ng/g, mean value 5.3 plus or minus 1.9 ppb. The benzo(a)pyrene concentrations ranged from 0.07 to 0.14 ppb, with a mean of 0.12 plus or minus 0.03 ppb. The levels found indicate a relatively low active input of benzo(a)pyrene and HCB into Galveston Bay, but a relatively high input of PCP compared to values in other locations. (Carroll-FRC)
W81-05456

DETERMINATION OF THE AQUEOUS CHLORINATION PRODUCTS OF HUMIC SUBSTANCES BY GAS CHROMATOGRAPHY WITH MICROWAVE EMISSION DETECTION,

Massachusetts Univ., Amherst. Dept. of Chemistry.
B. D. Quimby, M. F. Delaney, P. C. Uden, and R. M. Barnes.
Analytical Chemistry, Vol 52, No 2, p 259-263, February, 1980. 5 Fig, 25 Ref.

Descriptors: *Chlorination, *Drinking water, Trihalomethanes, *Humic acids, Gas chromatography, Microwaves, Emission spectroscopy, Chemical analysis, *Water analysis.

The aqueous chlorination products of humic and fulvic acids were examined by capillary column gas chromatography with an atmospheric pressure helium microwave emission detection system. The microwave emission detection system was chosen above the gas chromatography/mass spectrometry for the initial phase, as the primary objective was to screen for halogenated compounds. In addition to trihalomethanes, significant amounts of chlorinated phenolic and other acidic compounds were formed as well. When bromine is added to the chlorination mixture, bromine containing compounds are also produced. Since many of these compounds cannot be directly chromatographed, chemical derivatization with diazomethane was used. After methylation of the samples, the number of halogen-containing substances that appear in the element selective chromatograms is greatly increased. Several halogenated phenols and aromatic carboxylic acids were tentatively identified by retention times. (Baker-FRC)
W81-05461

NITROGEN SPECIFIC ION ELECTRODES FOR SOIL, PLANT, AND WATER ANALYSIS,

Georgia Univ., Athens. Dept of Horticulture.
H. A. Mills.
Journal of the Association of Official Analytical Chemists, Vol 63, No 4, p 797-801, July, 1980. 1 Tab, 31 Ref.

Descriptors: *Ion-selective electrodes, *Nitrogen, *Water analysis, Soil analysis, Ammonia, Nitrogen dioxide, Performance evaluation.

Nitrogen specific ion electrodes are evaluated in this review, which considers the factors influencing plant, soil, and water analysis for nitrogen compounds. The nitrate electrode is emphasized. This electrode measures the activity of the nitrate ion in solution and is susceptible to interfering ions, particularly chloride ion. In the literature there are many discrepancies concerning nitrate extracting solutions and buffering solutions used to eliminate interferences with the nitrate electrode. Ionic strength adjusters are used to alleviate fluctuating ionic background interferences. Consistent results are produced with (NH4)2S04 without adversely affecting the life of the nitrate electrode. The ammonia electrode is a rapid method for the determination of total nitrogen in soil, plant, and water samples which eliminates the time-consuming distillation-titration step. A relatively new procedure uses the nitrogen dioxide electrode. This is difficult to evaluate because there has been little information published on the methodology and its potential problems. (Small-FRC)
W81-05462

SPECTROPHOTOMETRIC DETERMINATION OF CARBOFURAN RESIDUES IN WATER,

Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Chemicals.
S. K. Handa.
Journal of the Association of Official Analytical Chemists, Vol 63, No 2, p 200-201, March, 1980. 1 Tab, 10 Ref.

Descriptors: *Pesticides, *Spectrophotometry, *Carbofuran, Nitric acid, Colorimetry, *Insecticides, Drinking water, Water analysis, Pollutant identification.

A spectrophotometric method was developed for the microdetermination of carbofuran in water. Carbofuran, a systemic insecticide, is highly toxic to mammals. The determination method is based on the reaction of carbofuran phenol with nitric acid to form a colored compound with an absorption maximum at 345 nm. The colorimetric method is simple, rapid, and precise. The absorption spectrum of the nitrated compound ranged from 300 to 450 nm, and the relationship between concentration and color intensity obeyed Beer's Law in the range 10-150 microgram/5 ml solution. This method has been satisfactorily applied to tap and field water samples. Recoveries of 91 to 97% were obtained from spiked water samples. (Small-FRC)
W81-05463

THE MEASUREMENT OF TOTAL ORGANIC CARBON AND TOTAL ORGANOHALOGENS AS PARAMETERS FOR WATER QUALITY EVALUATION,

National Inst. for Water Research, Pretoria (South Africa).
R. A. Van Steenderen.
Water S. A., Vol 7, No 1, p 28-34, January, 1981. 7 Fig, 2 Tab, 19 Ref.

Descriptors: *Water analysis, *Halogenated compounds, *Organic carbon, Drinking water, Chlorination, Halogens, Activated carbon, Chemical oxygen demand, Biological oxygen demand, Water treatment, *Water quality.

A review is presented of the relationship between biological oxygen demand, chemical oxygen demand, and total organic carbon methods for water quality assessment. Analytical techniques for the determination of total organic carbon and total organic halogens in drinking water are described. Also, total organic carbon and total organic halogen analyzers were applied to three water treatment plants in Pretoria. Source waters included dam and river water, both containing sewage effluent, and activated sludge plant effluent. It was found that the bulk of halogenated compounds was formed after chlorination, and that primary chlorination of raw water caused the formation of halogens that were only removed to a very limited extent by flocculation, sedimentation, sand filtration, and ozonation. Granulated activated carbon was successful in removing most halogens but did not remove total organic carbon. Main contributors to the volatile halogenated compounds were, in descending order: trichloromethane, dichlorobromomethane, and tribromomethane. These compounds amounted to less than 25% of the total organic halogenated compounds in the raw water, and 75% in the finished water. (Small-FRC)
W81-05467

NUTRIENT FLUX ESTIMATE BY PARTIAL LOAD METHOD,

National Water Research Inst., Vancouver (British Columbia). Pacific and Yukon Region.
L. J. Zeman, and O. Slaymaker.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 425-428, April, 1981. 2 Fig, 6 Ref.

Descriptors: *Pollution load, *Open channels, *Nutrients, Mathematical models, Fluctuations, Phosphorus, Water sampling, Water quality, Testing procedures, Okanagan River, Skaha Lake, British Columbia.

An outline is presented of an improved method designed for nutrient flux estimation in a fluvial channel. The study area was the Okanagan River reach at Penticton, British Columbia, a man-made channel 6.6 km long. The channel is affected by pollutant inputs from a municipal outfall, agricultural and urban runoff, seepage of groundwater, and riparian water from backswamp areas. During a two-day sampling period, hydrometric and chemical measurements were made at five channel cross sections, and loads were calculated in cross-sectional elements and their sums. The sum of the partial loads represented the total nutrient load passing through the channel cross-section. Statistical tests were used to calculate variation of the partial loads of the two phosphorus forms. The partial load method and confidence interval calculation yields nutrient flux estimates of improved precision by comparison with grab sample results. Single mean concentration data (grab samples) do

not reflect the heterogeneity of instantaneous measurements of nutrient loads, and they can cause over- or under-estimation. (Small-FRC)
W81-05490

MODIFIED EXTRACTION PROCEDURE FOR THE SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF ALUMINUM IN SEA WATER WITH PYROCATECHOL VIOLET AND REMOVAL OF EXCESS OF REAGENT,
Okayama Univ. (Japan). Dept. of Chemistry.
T. Korenaga, S. Motomizu, and K. Toei.
Analyst, Vol 105, No 1249, p 328-332. April, 1980. 3 Fig, 2 Tab, 25 Ref.

Descriptors: *Aluminum, *Sea water, Water analysis, Chemical analysis, Trace levels, Spectrophotometry.

The extraction-spectrophotometric determination of aluminum in river water with pyrocatechol violet and a quaternary ammonium salt has now been extended to sea water analysis. The ion associate between the aluminum-pyrocatechol violet complex and zephiramine was extracted into chloroform. The excess reagent co-extracted was removed by backwashing using 0.25 M sodium bromide solution at pH 9.5. The method is sensitive, selective and precise, with a relative standard deviation of less than 4%. The apparent aluminum content of sea water stored in ordinary containers such as glass and polyethylene bottles decreases gradually, but if the samples are acidified with 0.5 mg/l concentrated sulfuric acid, the aluminum content remains constant for at least one month. (Baker-FRC)
W81-05508

APPLICATION OF A CHELATING RESIN TO THE DETERMINATION OF TRACE AMOUNTS OF MERCURY IN NATURAL WATERS,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
E. Yamagami, S. Tateishi, and A. Hashimoto.
Analyst, Vol 105, No 1250, p 491-496. May, 1980. 5 Fig, 3 Tab, 23 Ref.

Descriptors: *Mercury, *Natural waters, Chemical analysis, Trace levels, Atomic-absorption spectrophotometry, Spectrophotometry, Chelating agents.

This paper describes the application of a chelating resin to the concentration of trace amounts of mercury in environmental water samples, followed by determination of the mercury by atomic-absorption spectrophotometry using the reduction-aeration technique. The method is relatively simple and inexpensive, and trace amounts of mercury in environmental water samples as large as 10 liters can be determined. The method involves the concentration of mercury from an acidified sample using the chelating resin and subsequent digestion of the resin with concentrated nitric acid, followed by determination of mercury by atomic-absorption spectrophotometry. Detection limits in 10 liter water samples are 10 ng mercury. Recoveries of inorganic mercury added to sea and river water samples at levels of 500 ng/5 liters were 98.4 and 95.7%, with coefficients of variation of 2.8 and 2.3%, respectively. (Baker-FRC)
W81-05509

SOECTROPHOTOMETRIC DETERMINATION OF MICROGRAM AMOUNTS OF CALCIUM IN WATERS AND FOODS USING DIPHENYLGLYOXAL BIS(2-HYDROXYBENXOYL HYDRAZONE),
Cordoba Univ. (Spain). Dept. of Analytical Chemistry.
M. Silva, and M. Valcarcel.
Analyst, Vol 105, No 1248, p 193-202, March, 1980. 4 Fig, 6 Tab, 39 Ref.

Descriptors: *Calcium, *Water analysis, Chemical analysis, Spectrophotometry, Chemical reactions, Reagents.

This work forms part of a systematic investigation of the use of alpha-bisaroyl hydrazones as analytical reagents. The preparation and properties of the bis(2-hydroxybenzoyl hydrazones) of diphenylglyoxal (BSHB) and dipyridylglyoxal (BSHP) are described in this paper. Diphenylglyoxal bis(2-hydroxybenzoyl hydrazone) reacts with calcium(II) at pH 12 to produce a yellow complex. At pH 7.80 another complex can be detected. Dipyridylglyoxal bis(2-hydroxybenzoyl hydrazone) also reacts with calcium. A method is proposed using spectrophotometry to determine calcium using diphenylglyoxal bis(2-hydroxybenzoyl hydrazone). Interferences were investigated, and when masking agents were added, common cations did not interfere. The determination of calcium in waters and foods has been made using the yellow calcium(II) complex, and the results are compared with those obtained with glyoxal bis(2-hydroxyanil). (Baker-FRC)
W81-05510

DETERMINATION OF SILVER, COBALT, MANGANESE, MOLYBDENUM AND TIN IN SEWAGE SLUDGE BY A RAPID ELECTROTHERMAL ATOMIC-ABSORPTION SPECTROSCOPIC METHOD,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
R. M. Sterritt, and J. N. Lester.
Analyst, Vol 105, No 1251, p 616-620, June, 1980. 2 Tab, 20 Ref.

Descriptors: *Sludge, *Chemical analysis, *Atomic absorption spectroscopy, Spectroscopy, Silver, Cobalt, Manganese, Molybdenum, Tin, Wastewater.

The work presented here describes the application of the rapid electrothermal atomic-absorption method to the determination of silver, cobalt, manganese, molybdenum and tin in sludge and a comparison of this method with results obtained from the flame atomic-absorption analysis of sulfuric acid-nitric acid and nitric acid-hydrogen peroxide digestates and dry-ashed samples. A sample of mixed primary sludge was collected in a polyethylene container and acidified to 1% V/V with nitric acid. The relative standard deviations observed for the flame atomic-absorption analyses of acid-digested and dry-ashed samples were generally higher than those obtained for the electrothermal atomic-absorption analyses of homogenized samples. No significant differences were found between the treatments for the determination of molybdenum. However, for silver, cobalt, manganese and tin significant differences were noted. It was concluded that the electrothermal atomic-absorption method was comparable to flame atomic-absorption analyses of dry ashed samples and suitable acid digestions of sludges. Pretreatment by homogenization was much less time consuming than acid digestions and dry ashing. Homogenization offered a greater precision than conventional pretreatment methods. (Baker-FRC)
W81-05511

UTILISATION OF THE MERCURY(II) CHLORIDE COMPLEX FOR THE LONG-TERM STORAGE OF SAMPLES CONTAINING PART PER 10 TO THE 9TH POWER LEVELS OF MERCURY,
Guelph Univ. (Ontario). Dept. of Chemistry.
J. R. Knechtel.
Analyst, Vol 105, No 1253, p 826-829, August, 1980. 3 Tab, 13 Ref.

Descriptors: *Mercury, *Chemical analysis, Water analysis, Chemical reagents, *Sample preservation.

Trials were performed on the preservation of mercury solutions stored in glass and polyethylene in the presence of sodium chloride (3% m/V) and nitric acid (0.1M). The method was developed for composite samples collected from an experimental system set up to study the effect on ground water of the application of sewage sludge to agricultural soils. The technique has proved very effective in preventing mercury losses. The method is particularly suitable when a reliable procedure is required for the preservation of very dilute solutions at the ppb mercury levels. The method can also be used when samples are collected over an extended time period (over three months in the present case) and also when there is a likelihood of sample freezing and thawing during the collection period. (Baker-FRC)
W81-05512

THE RELATIONSHIP BETWEEN ASBESTOS AND TURBIDITY IN RAW WATER,
Fred Hutchinson Cancer Research Center, Seattle, WA.
R. K. Severson, J. Harvey, and L. Polissar.
Journal of the American Water Works Association, Vol 73, No 4, p 223-224, April, 1981. 1 Fig, 11 Ref.

Descriptors: *Asbestos, *Turbidity, *Raw water, Physical properties, Water pollution, History.

Attempts to assess the potential relationship between asbestos in drinking water and cancer have been limited by the unavailability of data on historical exposure levels. Turbidity and asbestos levels were determined for 35 raw water samples obtained over a 9 month period from the Sultan Basin watershed in Washington. This watershed has been found to contain unusually high levels of asbestos. Analysis of the resultant scatterplots showed a significant correlation between turbidity and asbestos levels in this watershed. It is suggested that it may be possible to use historic turbidity data to assess exposure to waterborne asbestos in the past. Further research in which both the number of samples and the time frame of the study are increased should be conducted to document this relationship more completely. (Carroll-FRC)
W81-05514

DETERMINATION OF CAESIUM IN RIVER AND SEA WATERS BY ELECTROTHERMAL ATOMIC-ABSORPTION SPECTROMETRY. INTERFERENCE OF COBALT AND IRON,
Centro Informazioni Studi Esperienze, Milan (Italy).
P. Frigieri, R. Trucco, I. Ciaccolini, and G. Pampurini.
Analyst, Vol 105, No 1252, p 651-656, July, 1980. 3 Fig, 1 Tab, 18 Ref.

Descriptors: *Cesium, *Chemical analysis, Water analysis, Chemical interference, Atomic absorption spectroscopy, Spectroscopy, Cobalt, Iron, *Seawater, *Freshwater.

For the enrichment or recovery of cesium from various solutions, selective inorganic exchangers were considered. Ammonium hexacyanocobalt ferrate (NCFC) was chosen, as it can be employed in strongly acidic solutions, with the exception of concentrated sulfuric acid. The use of NCFC is particularly advantageous for the recovery of cesium from solutions obtained on acid dissolution of mineral or biological materials. Cesium is fully retained by the NCFC chromatographic column and can then be recovered by dissolution in hot sulfuric acid. The solution is then diluted and analyzed, either directly or following cesium separation, by atomic absorption spectrometry. A series of experiments were performed to study possible interfering species added to the aqueous cesium solution prior to analysis. Ionic interference in flame atomization processes caused by magnesium, calcium, strontium, and metals was investigated by electrothermal atomization measurements. This effect did not occur even when these elements were present in concentrations of thousands of ppm. Strong interferences were noted from iron and cobalt. (Baker-FRC)
W81-05515

AUTOMATED SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF BROMIDE IN WATER,
Geological Survey, Denver, CO
G. S. Pyen, M. J. Fishman, and A. G. Hedley.
Analyst, Vol 105, No 1252, p 657-662, July, 1980. 5 Fig, 3 Tab, 3 Ref.

Descriptors: *Bromide, *Water analysis, Chemical analysis, Spectrophotometry, Trace levels, Natural waters.

An automated method is described for the determination of bromide concentrations in natural waters. The method is based on the catalytic effect of bromide on the oxidation of iodine to iodate by potassium permanganate in sulfuric acid solution. Several samples were analyzed, and the results obtained were compared to those achieved using the manual catalytic method. It was determined that the automated method was less hazardous, did not require a skilled analyst, and was ideally suited for a high-production laboratory. It is rapid, accurate and precise, allowing 20 samples per hour to be analyzed to levels of 0.01 mg/l bromide. Recoveries of 94-110% were achieved. (Baker-FRC)
W81-05516

DETERMINATION OF DINITROTOLUENE ISOMERS IN SEA WATER AND INDUSTRIAL EFFLUENT BY HIGH-RESOLUTION ELECTRON-CAPTURE GAS CHROMATOGRAPHY WITH A GLASS CAPILLARY COLUMN,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
A. Hashimoto, H. Sakino, E. Yamagami, and S. Tateishi.
Analyst, Vol 105, No 1253, p 787-793, August, 1980. 4 Fig, 3 Tab, 12 Ref.

Descriptors: *Sea water, *Industrial effluents, *Chemical analysis, Water analysis, Dinitrotoluenes, Organic compounds, *Gas chromatography, Electron capture gas chromatography.

This paper describes the complete separation of six isomers of dinitrotoluene using a support-coated open-tubular (SCOT) glass capillary column equipped with an electron-capture detector and the applications of the method to qualitative and quantitative analyses of trace amounts of dinitrotoluene isomers in industrial effluent and sea water. The samples are extracted with benzene and the extract injected into the SCOT glass capillary column coated with Apiezon L grease. A chromatogram was completed in eight min. Sea water controls were spiked at levels of 0.8 and 8 microg/l with 2,6- and 2,5-dinitrotoluene. Samples were also spiked at 3.2 and 32 microg/l with 2,4- and 3,5-dinitrotoluene, and at 1.6 and 16 microg/l with the 3,4-dinitrotoluene isomer. Detection limits were 0.059, 0.045, 0.031, 0.13, 0.12, and 0.17 microg/l for 2,6- 2,3-, 2,5-, 2,4-, 3,4- and 3,5-dinitrotoluene, respectively. Further cleanup was not needed when the method was applied to sea water and industrial effluent. (Baker-FRC)
W81-05517

SPECTROPHOTOMETRIC DETERMINATION OF ANIONIC SURFACTANTS IN RIVER WATERS USING 1-(4-NITROBENZYL)-4-(4-DIETHYLAMINOPHENYLAZO)-PYRIDINIUM BROMIDE,
Okayama Univ. (Japan). Dept. of Chemistry.
K. Higuchi, Y. Shimoishi, H. Miyata, and K. Toei.
Analyst, Vol 105, No 1253, p 768-773, August, 1980. 5 Fig, 4 Tab, 3 Ref.

Descriptors: *Rivers, *Surfactants, Detergents, Soaps, Alkylbenzenesulfonates, Alkylsulfate, Spectrophotometry, Water analysis, *Chemical analysis.

This paper describes a simple and rapid method for the determination of microg/l levels of anionic surfactants in river waters, using 1-(4-Nitrobenzyl)-4-(4-diethylaminophenylazo)pyridinium bromide (NDP) and attaining 97-100% recovery levels. Nitro, bromo and methyl derivatives of NDP were synthesized and evaluated as new cationic reagents for the determination of anionic surfactants. The reagents react with anionic surfactants such as alkylbenzenesulfonate and alkylsulfate to form a 1:1 stable ion associate. This ion associate is extracted into chlorobenzene as a single extraction. The apparent molar absorptivity of the ion associate of the 4-nitro derivative with sodium di(2-ethylhexyl)sulfosuccinate was 61000 liter/mol/cm at 573 nm in chlorobenzene. The bromide derivative of NDP was used for determining trace levels of anionic surfactants in river water. The results of the analysis compared favorably with methylene blue determinations. (Baker-FRC)
W81-05518

PRESERVATION OF INORGANIC ARSENIC SPECIES AT MICROGRAM LEVELS IN WATER SAMPLES,
Canada Centre for Inland Waters, Burlington (Ontario).
V. Cheam, and H. Agemian.
Analyst, Vol 105, No 1253, p 737-743, August, 1980. 4 Fig, 1 Tab, 19 Ref.

Descriptors: *Arsenic, *Stability analysis, Acidity, Natural waters, Distilled water, Quality control, *Sample preservation.

The preservation and stability of arsenic in water was investigated. Two types of water were used: distilled water representing very clean water sample types, and Hamilton Harbor water, which is heavily loaded with nutrients, bacterial activity and major ions, forming the other extreme. Various conditions of storage such as pH, level of arsenic present, type of container material and size of container were studied for their effect on arsenic in storage conditions. Both arsenic (III) and arsenic (V) are preserved satisfactorily for a period of 125 days. This was true for both the distilled and natural water samples at one and 10 microg/l levels at room temperature when they were stored in polyethylene or Pyrex bottles with 0.2% V/V sulfuric acid. (Baker-FRC)
W81-05519

DETERMINATION OF ALKYLMERCURY IN FISH BY STEAM DISTILLATION AND COLD-VAPOUR ATOMIC-ABSORPTION SPECTROPHOTOMETRY,
Western Australia Government Chemical Labs., Perth.
D. L. Collett, D. E. Fleming, and G. A. Taylor.
Analyst, Vol 105, No 1254, p 897-901, September, 1980. 3 Tab, 26 Ref.

Descriptors: *Mercury, *Marine fish, *Pollutant identification, *Water pollution sources, Distillation, Pesticide residues, Heavy metals, Pollutants, Laboratory tests, Separation techniques, Spectrophotometry, Organic compounds, Environmental effects, Analytical techniques, Steam, Automation, Methylmercury chloride.

A method is described for determining levels of methylmercury chloride in fish tissue by steam distillation and cold vapor atomic-absorption spectrophotometry. Stock solutions of methylmercury working standard were added to samples of deep sea flathead, red snapper, and Durack River catfish for estimates of mercury recovery. The technique was also used for determining organic mercury in samples of kingclip, black marlin, red snapper, deep-sea flathead, and carpet shark. The method is not successful for extracting phenyl- or diphenyl mercury, but these compounds are not normally present in routine fish samples even when fish are caught downstream of a phenylmercury source. Recoveries of different levels of methylmercury chloride from spiked samples ranged from 96% to 104% in a single species. Total mercury levels ranged from 0.64 to 2.16 mg/kg of sample, while ratios of mean alkyl mercury content to mean total mercury ranged from 28 to 100%. The detection limit of the method was 5 ng. Addition of hydrogen sulfate to the working standard of methylmercury had no significant effect upon the absorbance. It was noted that factors such as age, mass, and environment also affect the levels of mercury found in marine fish. (Geiger-FRC)
W81-05520

DETERMINATION OF HCLO PLUS CLO(-) BY BROMINATION OF FLUORESCEIN,
California Univ., San Diego, La Jolla.
P. M. Williams, and K. J. Robertson.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2167-2173, August, 1980. 5 Fig, 1 Tab, 9 Ref.

Descriptors: *Water analysis, *Chlorine, *Fluorescein, Analytical techniques, *Pollutant identification, Seawater, Bromine.

Reactive chlorine (Cl equivalent to HClO plus ClO(-)) was determined in tap water and sea water by reaction with bromide ion. The HBrO and BrO(-) formed brominated fluorescein to produce the pink tetrabromo derivative, eosin, and, depending on the chlorine concentration, the mono-, di-, and tribromo derivatives. By measuring the decrease in fluorescein or increase in these brominated derivatives, chlorine may be determined visually between 0.02 to greater than 1 mg per liter; spectrophotometrically down to 0.005 mg per liter; and fluorometrically, as low as 0.00001 mg per liter. Ammonia causes interference, and monobromochloramines are included in the results. Monochloramine interference is prevented by the addition of sodium sulfite. The simple and inexpensive method may be used to monitor Cl content of swimming pools and drinking water. (Cassar-FRC)
W81-05549

IMPURITIES ARISING FROM THE USE OF XAD-2 RESIN FOR THE EXTRACTION OF ORGANIC POLLUTANTS IN DRINKING WATER,
Water Research Centre, Marlow (England). Medmenham Lab.
H. A. James, C. P. Steel, and I. Wilson.
Journal of Chromatography, Vol 208, No 1, p 89-95, 1981. 3 Fig, 1 Tab, 12 Ref.

Descriptors: *Water analysis, *Gas chromatography, Chemical composition, Solvents, Organic solvents, Resins, Drinking water.

A slight modification is presented to the most widely applied procedure for the extraction of low levels, less than 100 ng/liter, of organic compounds from drinking water. Using XAD-2 resin enables lower detection limits to be achieved, due to the absence of interfering compounds arising from breakdown of the resin. These interfering compounds had been associated with the passage of the water sample through the resin. GC-MS was used to identify the impurities, and it was then demonstrated by alternative extraction techniques that the laboratory tap water, derived from groundwater, used for most experiments did not contain detectable amounts of these impurities. Thus these impurities entered the samples due to the fracture of some of the resin beads when water is passed through the resin, displacing the methanol in which the resin was normally stored. These impurities can be minimized by using the solvent series methanol-diethyl-ether-water (sample), rather than methanol-water (sample). (Baker-FRC)
W81-05557

DETERMINATION OF LEAD IN DRINKING WATER BY ATOMIC-ABSORPTION SPECTROPHOTOMETRY USING AN ELECTRICALLY HEATED GRAPHITE FURNACE AND AN AMMONIUM TETRAMETHYLENEDITHIOCARBAMATE EXTRACTION TECHNIQUE,
Essex Water Co., Maldon (England).
R. P. Mitcham.
Analyst, Vol 105, No 1246, p 43-47, January, 1980. 1 Fig, 6 Tab, 8 Ref.

Descriptors: *Lead, *Water analysis, Trace levels, *Atomic absorption spectrophotometry, Spectrophotometry, Drinking water.

The use of an electrically heated graphite furnace for the determination of lead by atomic absorption spectrophotometry is a rapid, very sensitive method requiring almost no pretreatment of the sample. However, the application of the technique is limited by inorganic constituents in river and treated waters that interfere, causing marked suppresion. A more satisfactory method has been developed which separates the lead from the interferences prior to analysis. A rapid method has been developed using a semi-micro technique that chelates and separates the lead into an organic extract prior to analysis. The extract is then injected directly into the atomizer without the need to separate the two phases. (Baker-FRC)
W81-05586

THE SORPTION OF ZECTRAN ON BOTTOM SEDIMENTS AND PEAT MOSS,

Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
E. W. Matthews, and S. D. Faust.
Journal of Environmental Science and Health, Part B, Vol 16, No 3, p 325-336, 1981. 3 Fig, 1 Tab, 8 Ref.

Descriptors: *Zectran, *Organic matter, *Sorption, *Bottom sediments, *Insecticides, Pollutant identification, Chemical analysis, Sediments, Peat, Particulate matter, Errors, Carbamate pesticides.

Errors in determination of zectran, a carbamate insecticide, were attributed to sorption on particulates in water samples. To evaluate interference with the analytical method used, isotherm studies were run using aqueous solutions of zectran with bottom sediments and peat moss at pH 6.0 and 20 degrees C. Bottom sediments were 1.6 to 3.3% chemically oxidizable carbon, with a peat moss content of 47.9%. Although zectran sorption occurred in a direct relationship to the amount of chemically oxidizable carbon present in the organic matter, the extent of sorption was limited and was not a significant cause of error in the abbreviated LAT method. (Cassar-FRC)
W81-05592

GAS CHROMATOGRAPHIC DETERMINATION OF THE SOLUBILITY OF GASES IN LIQUIDS AT LOW PRESSURES,
Coimbra Univ. (Portugal). Chemical Lab.
A. M. da Silva, S. J. Formosinho, and C. T. Martins.
Journal of Chromatographic Science, Vol 18, No 4, p 180-182, April, 1980. 3 Fig, 1 Tab, 5 Ref.

Descriptors: *Gas chromatography, *Solubility, *Dissolved oxygen, Performance evaluation, Water analysis, Chromatography, Solvents.

A technique was developed which allows the quantitative gas chromatographic determination of gases dissolved in liquids, from partial gas pressures of 10-20 Torr up to 760 Torr. The technique was tested by measuring oxygen solubility in water, n-hexane, cyclohexane, and acetonitrile at oxygen pressures between 60 and 760 Torr. This technique is much simpler and more rapid than other current gas chromatographic techniques. Some chromatographic solubility measurements may be low because of the use of a preabsorbing column, but this technique eliminates the preabsorbing column, so it is more accurate. The method has a 3% precision. The method's sensitivity is about 100 times higher than one gas chromatographic technique used by Swinnerton; in general, sensitivity is better than with other current techniques. Sensitivity can be further improved by the injection of higher columns of solution. With an appropriate choice of the gas chromatographic columns, the researcher can measure the solubility of other inorganic and organic gases in several solvents. (Small-FRC)
W81-05596

DETERMINATION OF BENZIDINE AND 3,3-DICHLOROBENZIDINE IN WASTEWATER BY LIQUID CHROMATOGRAPHY WITH UV AND ELECTROCHEMICAL DETECTION,
Dow Chemical Co., Midland, MI. Analytical Labs.
D. N. Armentrout, and S. S. Cutie.
Journal of Chromatographic Science, Vol 18, No 8, p 370-374, August, 1980. 8 Fig, 2 Tab, 6 Ref.

Descriptors: *Gas liquid chromatography, *Benzidine, *3,3'-dichlorobenzidine, Wastewater analysis, Ultraviolet radiation, Electrochemistry, Chemical analysis, Performance evaluation, DCB.

A sensitive measurement method was developed for the determination of benzidine and 3,3'-dichlorobenzidine, compounds on the Environmental Protection Agency's priority pollutant list. Liquid chromatography is used which employs a LiChrosorb RP-2 column, 45% acetonitrile (pH 5) mobile phase, UV detection at 280 nm, and electrochemical detection at +0.70 volts applied potential. The electrochemical cell has three electrodes, including a tubular carbon-black/polyethylene working electrode that permits the detection of sub-part-per-billion levels in a 50 microliter injection. While UV detection is about 50 times less sensitive, a 500 microliter injection permits detection of 2 ppb benzidine and dichlorobenzidine. Detection of the chemicals in wastewater was performed. Recovery of benzidine at 1 to 6 ppb was 83%, and of dichlorobenzidine at 3 to 12 ppb was 87%. There is some potential interference by aromatic amines and phenols. (Small-FRC)
W81-05597

DETERMINATION OF GENTIAN VIOLET IN ANIMAL FEED, HUMAN URINE, AND WASTEWATER BY HIGH PRESSURE LIQUID CHROMATOGRAPHY,
National Center for Toxicological Research, Jefferson, AR.
L. G. Rushing, and M. C. Bowman.
Journal of Chromatographic Science, Vol 18, No 5, p 224-232, May, 1980. 4 Fig, 4 Tab, 18 Ref.

Descriptors: *Column chromatography, *Gentian violet, *Absorption, Fungicides, Water analysis, Wastewater analysis, Toxins, Performance evaluation, *Chromatography, High pressure liquid chromatography.

High pressure liquid chromatography procedures are described for the analysis of gentian violet in animal feed at levels within the range of 1000 ppm to 10 ppb, at 1 ppb in human urine, and at 10 ppb in wastewater. Gentian violet is used as a fungicide in agriculture, as an antimicrobial agent and an anti-parasitic agent in human medicine, and as a food additive in poultry raising. Some studies have shown it to be mutagenic and carcinogenic, and thus analysis methods were necessary in order to carry out studies under the National Toxicology Program. Cleaned-up extracts were analyzed by reverse-phase high pressure liquid chromatography using an absorption detector at 588 nm. Recoveries at the 10 ppb level from animal feed were 79%, human urine 58%, and wastewater 60%. A variety of solvent systems and extraction parameters were evaluated to determine the most efficient means of extracting residues from animal feed. Highest extraction efficiencies were obtained from both one hour and two hour extractions with 99% methanol-1%, 1 N HCl. Ancillary information is provided concerning the separation and analysis of six related triphenylmethane dyes. (Small-FRC)
W81-05598

TRACE ENRICHMENT METHODS FOR THE DETERMINATION OF METAL IONS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Lab.
R. M. Cassidy, and S. Elchuk.
Journal of Chromatographic Science, Vol 18, No 5, p 217-223, May, 1980. 10 Fig, 3 Tab, 31 Ref.

Descriptors: *Column chromatography, *Trace elements, *Water analysis, Metals, Performance evaluation, Laboratory equipment, Monitoring, High performance liquid chromatography, *Chromatography.

High performance liquid chromatography trace enrichment with detection after a post-column reaction was evaluated for the separation and determination of trace concentrations of metal ions. An inert enrichment system gave quantitative recoveries of metal ions from aqueous solutions at the ng/ml and pg/ml levels. When interfaced to a high performance chromatography equipped with a post-column-reactor detector, simultaneous enrichment and analysis were possible. The Flexibility of the system with regard to resolution, selectivity, and sensitivity makes it useful for monitoring natural waters and a wide variety of other aqueous solutions. Examples are presented of application of the system to nuclear reactant coolant and natural waters. Aminex columns showed only minor loss of efficiency after several months use, while most of the bonded-phase exchangers exhibited anomalous retention behavior and large differences in batch-to-batch ion-exchange capacity. (Small-FRC)
W81-05599

ANALYSIS OF PRIORITY POLLUTANTS BY CROSSED-BEAM LC/MS,
Dow Chemical Co., Freeport, TX.
M. J. McAdams, and M. L. Vestal.
Journal of Chromatographic Science, Vol 18, No 3, p 110-111, March, 1980. 4 Fig.

Descriptors: *Gas liquid chromatography, *Mass spectrometry, *Pollutant identification, Drinking water, Organic compounds, Lasers, Amines, Rotenone.

Some practical applications of liquid chromatography/mass spectrometry technique using laser vaporization and molecular beam techniques are presented. This method can be used to identify and quantify small amounts of organic pollutants in water. A mixture of benzidine, 4-chlorophenylphenol, di-n-octylphthalate, benzo(k)fluoranthene, benzo-a-pyrene, benzo(ghi)-perylene, and indeno(1,2,3cd)pyrene was analyzed to illustrate the method's usefulness in identifying amines in wastewater streams. Another potential application of the technique is for the analysis of rotenone, a pesticide used in fish population control. In a sample of New Orleans drinking water, the technique determined atrazine and two phtalates using molecular weight and fragmentation patterns. (Small-FRC)
W81-05600

RAPID GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF VOLATILE AND SEMIVOLATILE ORGANOCHLORINE COMPOUNDS IN SOIL AND CHEMICAL WASTE DISPOSAL SITE SAMPLES,
New Orleans Univ., LA. Center for Bio-Organic Studies.
I. R. DeLeon, M. A. Maberry, E. Overton, C. K. Raschke, and P. C. Remele.
Journal of Chromatographic Science, Vol 18, No 2, p 85-88, February, 1980. 1 Fig, 2 Tab, 7 Ref.

Descriptors: *Gas chromatography, *Groundwater pollution, *Chemical wastes, Soil analysis, *Waste dumps, Underground waste disposal, Leaching, Volatility, Organochlorine compounds.

A practical and effective method was developed for the simultaneous screening of soil and chemical waste disposal site samples for volatile and semivolatile organochlorine compounds. The procedure involves a simple hexane extraction followed by analysis of the extract by temperature programmed gas chromatography using electron capture detection and high-resolution glass capillary columns. The method can be used to determine the potential of buried chemicals for groundwater and other contamination. Temperature programming of the chromatographic column from minus 10 degrees C to 240 degrees C is employed because of the wide range of volatilities of the compounds. Combined gas chromatography/mass spectroscopy is used to determine the presence of chlorocarbons in the samples. Over 100 chemical waste disposal site and soil samples were evaluated using the method. The technique had a lower detection limit of at least 10 micrograms/g (10 ppm). The technique was effective in determining the perimeter and limits of an old chemical waste disposal site, and in accessing the extent of leaching of chlorocarbons from a waste disposal site into surrounding soil. (Small-FRC)
W81-05601

GAS CHROMATOGRAPHIC MEASUREMENT OF NITROUS OXIDE DISSOLVED IN WATER USING A HEADSPACE ANALYSIS TECHNIQUE,
Agricultural Research Council, Wantage (England). Letcombe Lab.
K. C. Hall.
Journal of Chromatographic Science, Vol 18, No 1, p 22-24, January, 1980. 4 Fig, 11 Ref.

Descriptors: *Gas chromatography, *Nitrous oxide, *Chemical analysis, Water analysis, Laboratory equipment, Electron capture gas chromatography.

A rapid and reliable headspace method is described for measuring the concentration of nitrous oxide

dissolved in wastewater which uses excess pressure and a simple apparatus. An aliquot of the water sample is equilibrated with nitrogen in a closed, pressurized vial. This excess pressure is used to inject the sample via a gas sampling valve. A column packed with Carbosieve B separates the nitrous oxide from other gases, and it is detected using an electron capture detector. Each analysis takes eight minutes. The coefficient of variation for 121 ng/ml nitrous oxide in water was 3.1%. The method may be used for other dissolved gases. If necessary, the sensitivity of the method may be increased by using a larger sample loop, although size is limited by the fact that it must be completely flushed by the gas in the vial. (Small-FRC)
W81-05602

THE CONCENTRATION, ISOLATION, AND DETERMINATION OF ACIDIC MATERIAL FROM AQUEOUS SOLUTION,
Ames Lab., IA.
J. J. Richard, and J. S. Fritz.
Journal of Chromatographic Science, Vol 18, No 1, p 35-38, January, 1980. 4 Fig, 2 Tab, 6 Ref.

Descriptors: *Anion exchange, *Pesticides, *Gas chromatography, Water analysis, Chemical analysis, Resins, Acids, Pollutant identification.

A new anion-exchange resin prepared from Rohm and Haas XAD-4 resin can be used to isolate and concentrate acidic organic material from water samples. Anion exchange is used because it recovers hydrophilic as well as hydrophobic materials. In this study, water samples were passed through the anion exchange column in the hydroxide form, then other organics were removed by washing with methyl alcohol and diethyl ether. Diethyl ether saturated with hydrogen chloride gas is used to elute the acids. After the effluent is concentrated, it is treated with diazomethane, and the methyl esters are separated by gas chromatography with a gas capillary column. Water samples were collected from pesticide disposal pits and the anaerobic digester of a wastewater treatment plant. Three of the compounds identified were 2,4-dichlorophenoxyacetic acid, tetrachloroterephthalic acid, and N-1-naphthylphthalamic acid. (Small-FRC)
W81-05603

DETECTION OF TRACE ORGANICS IN WELL WATER NEAR A SOLID WASTE LANDFILL,
Washington Univ., Seattle. Dept. of Environmental Health.
F. B. DeWalle, and E. S. K. Chian.
Journal of the American Water Works Association, Vol 73, No 4, p 206-211, April, 1981. 5 Fig, 3 Tab, 13 Ref.

Descriptors: *Trace levels, *Organic compounds, *Solid waste disposal, *Leachates, Landfills, Delaware, Water pollution sources, Water pollution control, Groundwater pollution, Chlorides, Chemical oxygen demand, Biological oxygen demand, Sanitary landfills.

The Army Creek landfill, about 60 miles southwest of Wilmington, Delaware, is located upstream from an artesian well field operated by a local water company. The landfill, which was utilized as the primary disposal location for municipal and industrial solid wastes for the county between 1960 and 1968, is at the site of an abandoned sand and gravel pit. About 30 percent of the volume of the landfill is located beneath the seasonal high water table. The clay layer at the top of the underlying aquifer was removed during excavation at five locations, exposing the aquifer to landfill leachate. Intensive pumping at the artesian well field located 3000 feet south and southwest of the landfill created a cone of depression which allowed migration of leachate contaminants from the landfill toward the wells. About five years after the landfill was closed, chemical analyses showed elevated chloride concentrations as far as 2500 feet down gradient from the landfill. A contaminant control program was instituted, which involved the installation of seven recovery wells between the landfill and the well fields to capture contaminated groundwater and discharge it to surface waters. Analysis of samples from the well field, the leachate in the landfill, and the major recovery well for trace organics identified a total of 41 volatile and 13 extractable compounds. The most polluted well was the major recovery well, indicating that it is effective in collecting the trace organics in leachate migrating from the landfill. Low molecular weight chlorinated compounds appear to have a much lower attenuation rate than biodegradable organics such as alcohols and ketones. The trace organics showed a 90 percent reduction in concentration for every 200 meters permeated through the aquifer, indicating that most of the biological degradation of the leachate occurs during the first few hundred meters of permeation. (Carroll-FRC)
W81-05609

IDENTIFICATION OF TRIALKYL AND TRIARYL PHOSPHATES IN DISTILLED AND SUPER-Q WATER,
Environmental Health Directorate, Ottawa (Ontario).
D. T. Williams, G. L. LeBel, and F. M. Benoit.
Journal of the Association of Official Analytical Chemists, Vol 64, No 3, p 635-640, April, 1981. 7 Fig, 2 Tab, 7 Ref.

Descriptors: *Organophosphorus compounds, *Water purification, *Phosphates, *Pollutant identification, Phosphorus compounds, Plasticizers, Water analysis, Pesticides.

In previous work on an analytical method for determining organophosphorus pesticides in drinking water, an unexplained peak appeared on the chromatogram. This paper reports that the impurity responsible for this peak was tributoxyethyl phosphate, present in the Millipore Super-Q purified water used during sample workup. In other distilled waters, this compound and others (trialkylaryl phosphate plasticizers and flame retardant additives) were identified, specifically tris(1,3-dichloropropyl) phosphate, triphenyl phosphate, and isopropylphenyl diphenyl phosphate. To prevent interference of these phosphates in analysis of environmental samples, distilled water should be routinely passed through XAD resins or extracted with methylene chloride. (Cassar-FRC)
W81-05615

GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC DETERMINATION OF VOLATILE ORGANIC COMPOUNDS IN FISH,
Environmental Protection Agency, Kansas City, KS. Region VII.
D. M. Easley, R. D. Kleopfer, and A. M. Carasea.
Journal of the Association of Official Analytical Chemists, Vol 64, No 3, p 653-656, 1981. 2 Fig, 1 Tab, 10 Ref.

Descriptors: *Fish, *Organic compounds, *Volatility, Gas chromatography, Mass spectrometry, *Pollutant identification.

A method for determination of purgeable organic compounds in water and wastewater was adapted to determine volatile organic compounds in fish. Fish tissue was added to reagent water, cooled in an ice bath, and sonified. An impinger-type purge apparatus was used to liberate the volatile materials at 70 degrees C. Computerized gas chromatography/mass spectrometry was used to identify the purged compounds. Overall average recovery for 39 volatile compounds was 77%, with an average standard deviation of 20%. (Cassar-FRC)
W81-05616

AUTOMATIC INCUBATOR FOR USE WITH MODIFIED A-1 TEST FOR ENUMERATING FECAL COLIFORM BACTERIA IN SHELLFISH GROWING WATERS,
Gulf Coast Research Lab., Ocean Springs, MS.
D. W. Cook.
Journal of the Association of Official Analytical Chemists, Vol 64, No 3, p 771-773, 1981. 1 Fig, 1 Tab, 3 Ref.

Descriptors: *Automation, *Incubation, *Coliforms, *Bacterial analysis, Water analysis, Pollutant identification.

An automatic incubator, constructed from easily obtainable materials, provides required temperatures for the AOAC method for enumerating fecal coliforms by the modified A-1 test. This apparatus will automatically change the incubation temperature after the three hour resuscitation period at 35 + or - 0.5 degrees C to the 44.5 + or - 0.2 degrees C final incubation temperature. No significant differences in coliform counts were seen in comparisons of this automatic incubator and the AOAC method. (Cassar-FRC)
W81-05617

COMPUTERIZED BIOLOGICAL MONITORING FOR DEMONSTRATING WASTEWATER DISCHARGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. Gruber, J. Cairns, Jr., and A. C. Hendricks.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 505-511, April, 1981. 5 Fig, 24 Ref.

Descriptors: *Monitoring, *Bioassay, *Computers, Wastewater disposal, Pollutant identification, *Wastewater analysis, Wastewater treatment, Fish, Bluegills, Bioindicators, Regulations, Automation, Chemical analysis.

A continuous, automatic biomonitoring facility for wastewater discharge incorporates bluegills, Lepomis macrochirus, in tanks arranged in two rows of 12. Ventilatory rates of the fish are counted with the aid of an on-line minicomputer system. A commercial chemical-physical monitor, interfaced to the computer system, continuously monitors conductivity, dissolved oxygen, pH, and temperature of the effluent. Yellow alarm lights turn on when a fish is assessed as breathing abnormally. If a given number of the lights are triggered simultaneously, an optional red light and bell may be turned on. This apparatus, costing $50,000 to $75,000 and housed in a 10 x 14 meter trailer, can aid a wastewater discharger in attaining compliance with regulations. Records generated can be easily stored and retrieved as needed. Additional cost benefits and savings are: fewer advanced chemical analyses, less overtreatment of effluents, less time and personnel needed for water quality assessment, and fewer fines. (Cassar-FRC)
W81-05641

ORGANIC CONTAMINATES IN WATER,
Cairo Univ., Giza (Egypt). Faculty of Agriculture.
M. A. Osman, M. Belal, A. M. Nomrossy, and A. M. Yousse.
Journal of Environmental Science and Health, Part B, Vol 15, No 3, p 295-306, 1980. 5 Fig, 5 Tab, 12 Ref.

Descriptors: *Water pollution, *Organic matter, *Endrin, Organic pesticides, *Pesticides, Aliphatic hydrocarbons, Aromatic compounds, Rivers, Drinking water, Drainage water, Egypt, Water analysis, Chemical analysis.

Since a complex mixture of natural and synthetic organic materials is present in surface water in micro concentrations, it is necessary to concentrate and separate samples prior to analysis. This study used the carbon adsorption method to separate organic matter from large samples of drainage, river, and tap waters in Egypt. The carbon chloroform extract was then separated into different solubility fractions, and the neutral fraction from this process was separated into aliphatic, aromatic, and oxy-compounds using column chromatography. Study results indicated that all samples contained both natural and industrial pollutants. While the industrial pollution was rather low, considerable natural pollution or sewage pollution was present. Analysis of the aromatic fraction of the water samples suggested that, while most of the organic pollutants in the river and tap water are still from natural processes, some wastes, such as the pesticide endrin, have begun to be present in low concentrations. (Carroll-FRC)
W81-05657

5B. Sources Of Pollution

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CONSIDERATIONS: PHASE III,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W81-05351

PRELIMINARY DELINEATION OF SALTY GROUND WATER IN THE NORTHERN ATLANTIC COASTAL PLAIN,
Geological Survey, Trenton, NJ. Water Resources Div.
H. Meisler.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $17.00 in paper copy, $5.50 in microfiche. Geological Survey Open-File Report 81-71, 1980. 12 p, 5 Fig, 1 Tab, 25 Ref.

Descriptors: *Saline water, *Groundwater, *Maps, *Saline-freshwater interfaces, Aquifers, Deep wells, Sea level, Chlorides, Brackish water, Brines, Water quality, *Coastal plains, *Northern Atlantic Coastal Plain.

Salty ground water underlies freshwater in the eastern part of the northern Atlantic Coastal Plain. The transition zone between freshwater and saltwater is represented in this report by a series of maps showing the depths to chloride concentrations of 250, 1,000, 10,000, and 18,000 milligrams per liter. The maps are based on chloride concentrations obtained from self-potential logs as well as from water-quality analyses. Depths to the designated chloride concentrations generally increase inland from the coast except in New Jersey where they are greatest along the coast and in North Carolina where depths to the 10,000 and 18,000 milligrams per liter concentrations are greatest beneath Pamlico Sound. The transition zone between 250 and 18,000 milligrams per liter of chloride is generally 1,500 to 2,300 feet thick except in part of North Carolina, where it is less than 1,000 feet. Depths to 250 and 1,000 milligrams per liter of chloride are probably controlled by the natural flow pattern of fresh ground water. Areas where these concentrations are relatively shallow generally coincide with areas of natural ground-water discharge. Depths to 10,000 and 18,000 milligrams per liter of chloride, and the occurrence offshore of ground water that is fresher than seawater, is attributed to long-term hydrologic conditions during which sea level fluctuations of a few hundred feet recurred several times. The origin of ground water that is saltier than seawater is attributed to the leaching of evaporitic strata beneath the Continental Shelf and Slope followed by westward movement of the brines during periods of sea-level rise. (USGS)
W81-05413

TOXICITY EVALUATION OF EFFLUENTS FROM THE WASTEWATER TREATMENT SYSTEM AT DSM'S CHEMICAL PLANT IN HOLLAND,
Waste Water Technology Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W81-05434

DISTRIBUTION OF HEAVY METALS AND RADIONUCLIDES IN SEDIMENTS, WATER, AND FISH IN AN AREA OF GREAT BEAR LAKE CONTAMINATED WITH MINE WASTES,
Alberta Environmental Centre, Vegreville.
J. W. Moore, and D. J. Sutherland.
Archives of Environmental Contamination and Toxicology, Vol 10, No 3, p 329-338, 1981. 3 Fig, 4 Tab, 26 Ref.

Descriptors: *Heavy metals, *Mine wastes, *Lakes, Lake sediments, Industrial wastes, Water pollution, Radioisotopes, Radium radioisotopes, Lead radioisotopes, Thorium radioisotopes, Mercury, *Arctic lakes, Fish, Trout, Sediments, Bottom sediments, Distribution patterns.

The discharge of mine wastes into lakes generally results in much higher concentrations of heavy metals and other contaminants in bottom sediments than in the overlying water. Although the transport and eventual distribution of pollutants in lakes is an important aspect of waste disposal planning and aquatic resource utilization, there is little information on the fate of mine wastes in arctic and subarctic waters. This study investigated the concentrations of heavy metals and radionuclides in the sediments and water of Great Bear Lake in northern Canada, which is near an operating silver mine and an abandoned uranium mine. These mines deposited tailings and other wastes directly into the lake. Mercury, lead, manganese, and nickel concentrations in the sediments were highest near the tailings deposit, decreasing significantly with increasing distance from the mine. There were significant positive correlations between these metals and the organic content of the sediments, but water depth and slope of the bottom had no impact on their distribution. Arsenic, cobalt, copper, radium-226, lead-210, and thorium-230 concentrations varied inconsistently throughout the study area, and their distributions could not be related to any of the environmental factors investigated. Significant negative correlations were found between thorium-232 and thorium-228 concentrations and distance from the mine and organic content of the sediments. Heavy metal and radionuclide levels in the water were generally below detectable limits, reflecting the strong chemical bonding characteristics of the sediments. Mercury concentrations in the tissues of lake trout were found to be low, probably reflecting low uptake rates and the ability of the fish to move into uncontaminated areas of the lake. (Carroll-FRC)
W81-05449

EFFECT OF TEMPERATURE ON GROWTH AND ACTIVITY OF AEROMONAS SSP. AND MIXED BACTERIAL POPULATIONS IN THE ANACOSTIA RIVER,
Maryland Univ., College Park. Dept. of Microbiology.
B. Z. Cavari, D. A. Allen, and R. R. Colwell.
Applied and Environmental Microbiology, Vol 41, No 4, p 1052-1054, April, 1981. 1 Tab, 11 Ref.

Descriptors: *Fate of pollutants, *Temperature effects, *Aeromonas, Bacterial analysis, Rivers, Water quality, Public health, Pathogenic bacteria, Sediments, Water analysis, Sewage bacteria, Anacostia River, District of Columbia.

The factors affecting the survival of Aeromonas ssp. in the Anacostia River of Washington, D. C., were examined to determine those factors which control the seasonal incidence of the bacteria in the natural environment. Water and sediment samples were collected over a 2 year period at the Anacostia River Divers' Training Site and analyzed for aerobic, heterotrophic bacteria and Aeromonas ssp. Total bacterial counts in the water column and in the sediment were two- to eight-fold higher in the winter than at the other times of the year. However, the number of Aeromonas ssp. was decreased significantly during the winter months, due to the reduced metabolic activity of the microbes at low temperatures. It was suggested that Aeromonas ssp. entering bodies of water in temperate environments via sewage effluent or other sources would experience a significant decrease in the number of viable cells during colder months. (Geiger-FRC)
W81-05453

DETERMINATION OF THE AQUEOUS CHLORINATION PRODUCTS OF HUMIC SUBSTANCES BY GAS CHROMATOGRAPHY WITH MICROWAVE EMISSION DETECTION,
Massachusetts Univ., Amherst. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W81-05461

LEACHABILITY OF FOUNDRY PROCESS SOLID WASTES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
R. K. Ham, W. C. Boyle, and T. P. Kunes.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 155-170, February, 1981. 7 Fig, 3 Tab, 7 Ref.

Descriptors: *Metallurgy, *Leaching, *Solid wastes, Testing procedures, Sand, Industrial wastes, Water pollution sources, Landfills, Temperature effects.

A standardized procedure was developed for determining maximum leachability or matter release from foundry sand waste materials. The shake-flask method was used to determine the amount of matter which can be removed from foundry sand materials by direct solubility or desorption. The shake-flask procedure was used on eight different foundry sands representative of the many core and system sands. The level of process temperature to which sand was subjected in the foundry had a major effect on leaching potential. The highest COD levels were obtained with phenol-formaldehyde shell sand. The highest BOD levels were obtained from furan no bake sand. Sands not subjected to process temperatures generally showed the greatest matter release. Leaching potential of a land fill will be affected by the amount of molding sand containing clay and the size and amount of core butts present. For foundry waste management, the following must be determined: total amounts and types of waste produced, types and amounts of resins and additives used, and process areas within the foundry that produce wastes. (Small-FRC)
W81-05487

NUTRIENT FLUX ESTIMATE BY PARTIAL LOAD METHOD,
National Water Research Inst., Vancouver (British Columbia). Pacific and Yukon Region.
For primary bibliographic entry see Field 5A.
W81-05490

SIMULATING MASS TRANSPORT IN UNCONFINED AQUIFERS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 2F.
W81-05497

ANALYSIS OF A NUMERICAL SOLUTION TO THE ONE-DIMENSIONAL STOCHASTIC CONVECTION EQUATION,
Battelle Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 7B.
W81-05501

THE NUTRIENT CONTENT OF PRECIPITATION, DRY FALLOUT, AND INTERCEPTED AEROSOLS IN THE CHAPARRAL OF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 7B.
W81-05504

URBAN RUNOFF RECEIVING WATER IMPACTS: PROGRAM OVERVIEW,
Municipal Environmental Research Lab., Edison, NJ. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 4C.
W81-05534

FLOW APPROACHING FILTER WASHWATER TROUGHS,
Camp Dresser and McKee, Inc., Boston, MA.
For primary bibliographic entry see Field 5F.
W81-05543

CONTRIBUTION OF WASTEWATER DISCHARGES TO OCEAN SURFACE PARTICULATES,
Swanson-Oswald Associates, San Francisco, CA.
L. W. Bracewell, R. E. Selleck, and R. Carter.

Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2230-2245, August, 1980. 10 Fig, 10 Tab, 15 Ref.

Descriptors: *Organic compounds, *Water quality, *Coliforms, Seawater, Outlets, *Wastewater disposal, Path of pollutants, Water pollution sources, Aesthetics, Pesticides, Bacteria, Disposal, Oil wastes, San Pedro Channel, California.

Samples of ocean surface water were collected by trawling in the San Pedro Channel, California, near and at varying distances from major sewage effluent outfalls. Most of the particulates originating from waste water were grease and wax. The total hexane-extractable materials (HEM) were composed of 12% free fatty acids, 21% alkanes, 19% fats, 10% unidentifiable long chain compounds such as alcohols and waxes, and 38% bound water. Less than 0.10% of the grease and oil were pesticides and polychlorinated biphenyls. Coliform bacteria were plentiful, 7300 organisms per mg of HEM. Particulates larger than 0.5 mm rose rapidly to the surface and quickly disappeared, being eaten, caught on kelp, or transported to the coast. HEM appeared to be a reliable index of waste water origin--32,500 micrograms HEM per sq meter near the outfalls and 0.4 microgram per sq meter in the control area. Aesthetic ratings and bacteriological considerations were used to develop an upper limit of 3 mg HEM per sq meter. (Cassar-FRC)
W81-05552

THE ENRICHMENT OF SOIL PHOSPHORUS IN RUNOFF SEDIMENTS,

Oklahoma State Univ., Stillwater. Dept. of Agronomy.
A. N. Sharpley.
Journal of Environmental Quality, Vol 9, No 3, p 521-526, July-September, 1980. 3 Fig, 7 Tab, 26 Ref.

Descriptors: *Phosphorus, *Runoff, *Soils, Chemical properties, Physical properties, Sediment discharge, Sediments, Erosion, Clays, Soil chemistry, Eutrophication, Natural waters.

The effect of varying soil physical and chemical properties, soil slope and rainfall intensity, and overland flow on the enrichment of soil P in runoff was investigated. The enrichment of P in runoff increased with increases in P additions. The P enrichment ratio of Bernow soil increased from 2.43 to 6.29 at P additions of 0 and 100 kg P/ha, respectively. The enrichment ratio decreased as rainfall intensity and soil slope were increased. A significant linear relationship between the enrichment ratio and sediment discharge was obtained for all treatments studied. Similar slopes were obtained for soils ranging in texture from a fine sandy loam to a clay under similar conditions. The slopes were not affected by soil P status. With an increase in energy of runoff and kinetic energy of rainfall, a significant increase in slope of the relationship between the enrichment ratio and sediment discharge was obtained. A decrease in energy of rain, as in the case of overland flow and increased soil cover, resulted in a significant decrease in slope. The data indicated that runoff and rainfall energy and soil P status have greater effect on enrichment ratio than soil physical properties. A general relationship between enrichment ratio and sediment discharge covering all treatments predicted ratios very similar to those measured in field studies and those predicted by a general relationship derived from field studies. (Baker-FRC)
W81-05561

STORMWATER POLLUTANT LOAD-RUNOFF RELATIONSHIPS,

Rice Univ., Houston, TX.
For primary bibliographic entry see Field 2A.
W81-05574

AIRBORNE BACTERIAL DENSITIES AT AN ACTIVATED SLUDGE TREATMENT PLANT,

Alberta Univ., Edmonton.
P. M. Fedorak, and D. W. S. Westlake.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2185-2192, August, 1980. 8 fig, 4 Tab, 18 Ref.

Descriptors: *Activated sludge, *Bacteria, *Hazards, *Aerosols, Aeration, Path of pollutants, Wastewater treatment, Public health.

A short term aerosol sampling survey at the activated sludge plant in Edmonton, Alberta, Canada, included outdoor sites and indoor sites. Highest airborne bacterial counts were found nearest aeration sources and during periods of highest aeration rates. Outdoor locations and viable particles per cu meter were: background, 27; grit tanks, 710; influent of primary settling tank, 300; middle of the primary settling tank, 110; effluent of the primary settling tank, 20; Tank 1 activated sludge aeration section, 1000; Tank 5 activated sludge aeration section, 1800; final settling tanks, 62; north of final settling tanks, 18; and above the river outfall, 200. Indoor locations and viable particles per cu meter were: master control room, 10; near the running faucets for sampling various waste streams, 50-2600; 4 meters from the sampling taps (running), 38-560; at the sludge pump house, 2000; and the aerobic sludge sampling tap, 65. In the laboratory, moderate density, short term aerosols were generated during analysis and disposal of waste water samples. For example, over a 20 min sampling period, an average of 67 and a maximum of 140 viable particles per cu meter were generated during dispensing of an activated sludge sample. Damp mopping the floor produced 320 viable particles per cu meter. Aerosol dissemination may be minimized by covering the continuously running sample sinks and by exercising care during laboratory procedures. (Cassar-FRC)
W81-05576

A REVIEW OF WATER QUALITY ISSUES ASSOCIATED WITH COAL STORAGE,

Oak Ridge National Lab,. TN.
E. C. Davis, and W. J. Boegly, Jr.
Journal of Environmental Quality, Vol 10, No 2, p 127-133, April-June, 1981. 1 Fig, 8 Tab, 13 Ref.

Descriptors: *Coal, *Leaching, *Storage, Rainfall, Runoff, Sulfur, Particle size, Research priorities, Reviews.

A review is presented of studies which assessed the effect of coal pile leachate to determine the potential environmental impact and suggest directions for future research. Literature dealing with coal storage runoff is scarce and poorly documented. Most of the data is collected from the analysis of grab samples taken during leaching experiments or from sampling during rainfall. Potential water quality issues are identified in the review, and coal storage conditions that intensify acid drainage problems are discussed. Adverse impacts on aquatic life and water quality are usually associated with increases in suspended sediment and acidity. Factors which intensify the problem include increased sulfur content in coal, coal particle size, age of pile, pile configuration, temperature, microorganisms present, distance to receiving stream, and coal-rainwater contact time. Future research should be designed to identify the organic chemicals present in leachate, to determine methods of treating leachate, to develop standarized laboratory leachate tests, and to develop predictive models. (Small-FRC)
W81-05588

THE SORPTION OF ZECTRAN ON BOTTOM SEDIMENTS AND PEAT MOSS,

Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5A.
W81-05592

FATE AND TOXICITY OF ACEPHATE (ORTHENE) ADDED TO A COASTAL B.C. STREAM,

Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
G. H. Geen, M. A. Hussain, P. C. Oloffs, and B. A. McKeown.
Journal of Environmental Science and Health, Part B, Vol 16, No 3, p 253-271, 1981. 4 Tab, 5 Ref.

Descriptors: *Acephate, *Toxicity, *Insects, *Fish, Absorption, *Insecticides, Pesticides, Methamidophos, Trout, Streams, Environmental effects, Sediments, Fate of pollutants, Aquatic animals, Accumulation.

Acephate was added to a small stream, Hidden Creek, British Columbia, to assess its environmental effects. For practical purposes, no acephate or its hydrolysis product, methamidophos, remained in sediments, fish, or insects after 24 hours. A level of 1100-1200 ppb acephate was maintained for five hours in the stream water. When acephate addition was discontinued, 24 ppb remained in the water at eight hours and none at 96 hours. No methamidophos was detected. Acephate was first detected in sediments one to four hours after addition, depending on the site of sampling, and reached its highest concentration, 131.6 ppb, four hours later. Methamidophos concentrations reached a maximum level between four and eight hours. Neither chemical was detectable in sediments by 96 hours. No mortality of fish, insects, nymphs, or larvae was seen in the 96-hour observation period. Highest acephate concentrations detected in fish were 42 ppb, methamidophos, 3.3 ppb, at five hours; and in insects, 1190 ppb and 358.9 ppb, respectively, also at five hours. Neither pesticide was detected in fish or insects at 24 hours. (Cassar-FRC)
W81-05593

STABILITY OF PARATHION AND DDT IN DILUTE IRON SOLUTIONS,

Department of Agriculture, London (Ontario). Research Inst.
B. T. Bowman, and W. W. Sans.
Journal of Environmental Science and Health, Part B, Vol 15, No 3, p 233-246, 1980. 5 Fig, 14 Ref.

Descriptors: *Parathion, *Iron, *Hydrolysis, Degradation, Chemical degradation, Catalysts, Ions, DDT, *Pesticides.

The role of ferric salts in the degradation of parathion and DDT in aqueous solutions was investigated, and parathion stability in AlCl3 solutions was examined. Dilute FeCl3 and Fe(NO3)3 solutions were found to degrade parathion to paraoxon and p-nitrophenol. The Fe3+ ion was less active than some of its hydrolysis products in catalyzing the degradation of parathion. The initial products of iron hydrolysis, which tend to be monomeric, may be the most active catalysts. The catalytic effect of the hydrolysis products appeared to decrease with time. Parathion degradation in acidic iron solutions was not significantly affected by pH. Although parathion degradation in iron solutions is dependent on concentration, the fact that iron hydrolysis proceeds faster in more dilute solutions complicates this relationship. AlCl3 did not catalyze parathion breakdown over a 336 hour period. DDT degradation was not catalyzed by iron nor FeCl3 and Fe(NO3)3 solutions. Although these results indicate that iron and/or its hydrolysis products could facilitate parathion degradation in soil and aquatic systems, the catalytic behavior may be diminished in such natural systems by the stable complexes that iron forms with organic matter. (Carroll-FRC)
W81-05595

LOSS OF CHLORPYRIFOS IN POND WATER: EXAMINATION OF RESULTS USING THREE SIMPLE MATHEMATICAL MODELS,

Manitoba Univ., Winnipeg. Pesticide Research Lab.
G. J. Reimer, and G. R. B. Webster.
Journal of Envirnomental Science and Health, Part B, Vol 15, No 5, p 559-569, 1980. 1 Fig, 2 Tab, 7 Ref.

Descriptors: *Insecticides, *Decomposition, *Mathematical models, Degradation, Pesticides, Fate of pollutants, Ponds, *Chlorpyrifos.

Chlorpyrifos is the active ingredient in Dursban insecticide, which is used as a mosquito larvicide. The loss of chlorpyrifos in pond water was investigated by fortifying man-made pools with two formulations of the insecticide, the emulsifiable concentrate, which contained 48 percent active ingre-

dient, and the slow-release granular formulation, with 2.5 percent active ingredient. Chlorpyrifos concentration-time data were analyzed using three mathematical models: the power rate model, the hyperbolic rate model, and an empirical power function. The concentration-time data showed that the half-life of chlorpyrifos was 5 plus or minus 3 hours for the concentrate and 14 plus or minus 4 hours for the slow-release formulation. The average correlation coefficients for the three mathematical models, determined by linear regression, were 0.78 plus or minus 0.08 for the power rate model, 0.84 plus or minus 0.07 for the hyperbolic rate model, and 0.76 plus or minus 0.16 for the empirical power function. It was concluded that all three models performed essentially equally in describing the degradation of chlorpyrifos in pond water. (Carroll-FRC)
W81-05604

THE DEGRADATION OF (14C) MOLINATE IN SOIL UNDER FLOODED AND NONFLOODED CONDITIONS,
Stauffer Chemical Co., Mountain View, CA.
V. M. Thomas, and C. L. Holt.
Journal of Environmental Science and Health, Part B, Vol 15, No 5, p 475-484, 1980. 6 Fig, 4 Ref.

Descriptors: *Degradation, *Herbicides, *Soils, Pesticides, Flood irrigation, Flooding, Irrigation, Rice, Radioactive half-life, Oxidation, *Molinate.

Molinate is a selective herbicide used to control barnyard grass in rice cultures. Emulsifiable liquid or granular formulations are applied to rice paddys preflood with soil-incorporation or by air after the permanent flood is established. The degradation of (14C) molinate applied to soil under flooded and nonflooded conditions was investigated in laboratory studies. When the herbicide was applied under nonflooded, moist soil conditions, 50 percent of the applied molinate was lost in three weeks. Under flooded conditions, 50 percent loss was not achieved until 10 weeks after application. However, if the flooded fields were permitted to become aerobic by removing the flood water, the molinate remaining dissipated at a rate similar to that from nonflooded soil. Analysis of the soil and flood water for molinate and its degradation products showed that very little breakdown of molinate occurred under flooded conditions, with volatilization providing the primary path of dissipation. Under nonflooded conditions, hydroxylation of the azepine ring and further oxidation to the respective ketones was found to occur. Other proposed paths of degradation include oxidation to form the sulfoxide, cleavage to yield the imine, acetylation of the imine, and deethylation processes. (Carroll-FRC)
W81-05605

TRICHLOROETHYLENE AND METHYL CHLOROFORM IN GROUNDWATER: A PROBLEM ASSESSMENT,
Weston Designers-Consultants, West Chester, PA.
J. C. Petura.
Journal of the American Water Works Association, Vol 73, No 4, p 200-205, April, 1981. 3 Fig, 5 Tab, 6 Ref.

Descriptors: *Groundwater pollution, *Chlorinated hydrocarbons, *Water pollution control, Chloroform, Groundwater management, Halogens, Water treatment.

Trichloroethylene and methyl chloroform have been recurringly detected in numerous groundwater samples throughout the country. These chlorinated organic compounds do not occur naturally in groundwater and pose serious public health problems in many areas. Sources of these contaminants include current or past users of the compounds, residential use of septic tank cleaners containing the compounds, and illicit dumping of industrial wastes. There are as yet no regulations or legislation restricting the use of these compounds. Initial responses to the discovery that a well is contaminated should include immediate cessation of use of the well, sampling of other wells in the immediate area to establish the zone of contamination, and investigation to determine the source of contamination. Long range problems posed by groundwater contamination with these chlorinated compounds include location of new permanent water supplies for affected consumers and development and implementation of a recovery program to prevent further spread of the pollutant and to restore the aquifer to acceptable quality. Individuals and small community suppliers in rural areas may have to choose between treatment of water from the existing well and digging a new well. The only treatment method which is currently economically feasible for small scale application is adsorption by granular activated carbon, and even this method poses several problems for individual well owners. The spread of the pollutant in the aquifer can be controlled through a strategy of dynamic pumping to remove contaminated water from the aquifer. However, the recovered contaminated water must then be treated prior to discharge. Also, such recovery programs must be conducted over a period of several years in most cases. (Carroll-FRC)
W81-05610

CHEMICAL CONTAMINATION OF AQUIFERS ON LONG ISLAND, NEW YORK,
Suffolk County Water Authority, Oak Dale, NY.
A. A. Guerrera.
Journal of the American Water Works Association, Vol 73, No 4, p 190-199, April, 1981. 10 Fig, 6 Ref.

Descriptors: *Groundwater pollution, *Aquifer systems, Water pollution sources, *Long Island, New York, Suffolk County, Nassau County, Aquifers, Regulations, Public health, Public relations, Water pollution control.

Almost three million people are served exclusively with groundwater developed in the aquifer system underlying Nassau and Suffolk counties on Long Island, New York. Contamination of this aquifer system would pose a significant hazard to public health. Although the groundwater reservoir contains over 60 trillion gallons, if it is to meet future needs provisions must be made for solving water quality problems in local areas and for adopting proper management techniques to alleviate production imbalances. Volatile halogenated hydrocarbon solvents and a carbamate pesticide at parts per billion levels have recently been detected in groundwater samples. The response of local regulatory agencies to the uncertain health risks associated with these chemicals has had a dramatic and costly effect on the ability of local water suppliers to meet the needs of consumers. Many of the 128 water suppliers have had to replace the lost capacity of restricted wells by drilling new wells at new locations. It is suggested that rigid interpretation of laboratory data of uncertain precision and the premature and incomplete release of findings of instances of contaminated samplings have resulted in loss of consumer confidence and in excessive expenses. (Carroll-FRC)
W81-05611

RIGHTS AND LIABILITIES OF WATER SUPPLIERS ARISING FROM GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 6E.
W81-05612

GROUNDWATER CONTAMINATION IN CONNECTICUT,
Connecticut Dept. of Health, Hartford.
R. S. Woodhull.
Journal of the American Water Works Association, Vol 73, No 4, p 188-189, April, 1981.

Descriptors: *Groundwater pollution, *Connecticut, *Organic compounds, Trace levels, Carcinogens, Chemical wastes, Legal aspects, Regulations, State jurisdiction, Water pollution sources, Water pollution treatment, Municipal water.

Although traditional health department programs in Connecticut have established and maintained good control over groundwater contamination from sewage effluents, serious pollution problems are now developing as a result of previously unregulated discharge of various chemicals or chemical solutions onto or into the ground. Trace quantities of volatile organic chemicals which are potential carcinogens were discovered in 87 percent of waters supplying utilities serving 1,000 people or more. (Testing was conducted at 78 percent of the 95 water utilities in this size category). Chemical levels in excess of the U.S. Environmental Protection Agency's (EPA's) suggested no-adverse-response level were detected at 23 wells serving 17 of the systems. Connecticut has developed a plan to be followed by each utility in dealing with chemical contamination levels exceeding this level, which includes finding the source of the pollution, notifying customers, correcting the problem, and providing alternative water supplies. Trihalomethanes constituted the major pollutant where excessive organic chemical contamination was found. A plan of action to be followed when water supplies are found to have chemical levels exceeding 70 percent of a suggested no-adverse-response level has also been instituted. This plan includes a sampling program, to be followed by remedial action where necessary. Other groundwater pollutants which are causing increasing concern include road salt, fertilizers, volatile organic solvents or degreasers, gasoline and oil from storage tanks, oil from distribution system leaks, and leachates from municipal and industrial disposal sites. A groundwater classification scheme is currently being developed by the state of Connecticut to help protect drinking water aquifers from chemical contamination by regulating disposal sites. However, there is also a need for a Federal or State program to assist owners of wells which have been contaminated. (Carroll-FRC)
W81-05613

PERSISTENCE OF CARBARYL IN CANAL WATER,
Cairo Univ., Giza (Egypt). Faculty of Agriculture.
M. A. Osman, and M. H. Belal.
Journal of Environmental Science and Health, Part B, Vol 15, No 3, p 307-311, 1980. 1 Fig, 1 Tab, 6 Ref.

Descriptors: *Insecticides, *Water pollution, *Canals, Drainage canals, Irrigation canals, *Egypt, Decomposition, Pesticides, *Carbaryl.

Pesticides which are widely used for crop protection in Egypt may reach irrigation and drainage water systems by spray drift, aerial spraying, or run-off from agricultural land. Very little information is available on the persistence and degradation of the insecticide carbaryl (Sevin) in water. This study investigated the stability and decomposition of carbaryl in flowing canal water. An irrigation and drainage water canal was sprayed along a 50 meter stretch with an 85 percent carbaryl solution. Water samples were then collected daily from the sprayed area and from the end of the canal. Carbaryl and 1-naphthol, a decomposition product of carbaryl, were detected in the irrigation and drainage canal water samples. However, both the residues of the insecticide and its degradation product 1-naphthol disappeared from the canal water six days after the spraying. (Carroll-FRC)
W81-05652

EFFECTS OF PADDY WATER AND SOME PHOTOSENSITIZERS ON THE PHOTOLYSIS OF THE FUNGICIDE ISOPROTHIOLANE,
Kyushu Univ., Fukuoka (Japan). Dept. of Agricultural Chemistry.
S-S. Chou, and M. Eto.
Journal of Environmental Science and Health, Part B, Vol 15, No 2, p 135-146, 1980. 4 Fig, 1 Tab, 8 Ref.

Descriptors: *Fungicides, *Decomposition, *Irradiation, Pesticides, Photolysis, Ultraviolet radiation, Rice, Chlorophyll, *Isoprothiolane, Rice-paddy water.

Isoprothiolane is a systemic fungicide used to control rice blast disease and rice stem rot. It can be applied either to rice paddy water or to foliage. Photoreactions contributing to the fate of pesticides in the environment are affected by the wavelength of light, the state of the substrate, and

coexisting materials such as air, water, and sensitizers. The photolysis of isoprothiolane in aqueous media and the effect of some photosensitizers were investigated in a laboratory environment. The fungicide was found to decompose slowly in deionized water under ultraviolet light or sunlight irradiation. Photodegradation was significantly accelerated when rice-paddy water was used. The photosensitizing effect of the paddy water was comparable to that of 2 percent acetone. Isothiolane photolysis was not affected by soil extracts, rice-plant extracts, or chlorophylls. Tryptophan showed a relatively weak accelerating effect on photolysis after a considerable time lag. The presence of riboflavin accelerated the photolysis of the fungicide remarkably, but this effect was suppressed by nitrogen gas stream. It was concluded that natural photosensitizers and air appear to play very important roles in the photolytic degradation of isothiolane in the environment. (Carroll-FRC)
W81-05655

THE DYNAMICS OF AEROBIC PHENOL BIODEGRADATION IN LOWER GREENSAND,
Harwell Lab., Oxon (England). Environmental and Medical Sciences Div.
J. F. Rees, and J. W. King.
Journal of Chemical Technology and Biotechnology, Vol 30, No 7, p 396-404, July, 1980. 5 Fig, 3 Tab, 14 Ref.

Descriptors: *Biodegradation, *Bacteria, *Phenols, *Landfills, Industrial wastes, Microbial degradation, Microorganisms, Aromatic compounds, Organic compounds, *Leachates.

Reaction kinetics of phenol degradation were examined to better understand the fate of phenol leaching from a landfill through unsaturated rock to the groundwater. Phenol solutions at concentrations of 50 to 24,840 mg per cu dm were percolated at flow rates from 0.5 to 4.5 cu cm per hour through columns of Lower Greensand, and the output concentrations and rate constants were determined. At flow rates of 1 cu cm per hour, reaction kinetics were first-order up to a maximum phenol concentration of 9.2 g per cu dm. Maximum degradation took place at 16.7 g per cu dm phenol. At 22.3 g per cu dm partial inhibition of degradation was evident. At flow rates of 3 cu cm per hour, first-order reaction kinetics was observed. Maximum degradation occurred at 9.7 g per cu dm, and higher levels of phenol inhibited degradation. Phenol decomposition was attributed to biological agents, Pseudomonas dacunhae predominant. Although these bacteria grew well in soil columns, at phenol levels of several grams per cu dm, they were inhibited in a liquid medium at phenol levels greater than 250 mg per cu dm. The rate limiting step in the reaction is apparently phenol diffusion from the bulk liquid phase across a stagnant liquid film surrounding the microbes. The film does not consist of several layers of microbes. Under field conditions, at a flow rate of 300 mm per year, an initial concentration of 10,000 mg per cu dm would be degraded to levels of 10, 1, and 0.1 mg per cu dm in 50, 65, and 80 days, respectively. (Cassar-FRC)
W81-05660

5C. Effects Of Pollution

FINAL ENVIRONMENTAL IMPACT STATEMENT ON USE OF LAMPRICIDES IN AN EXPERIMENTAL PROGRAM TO REDUCE SEA LAMPREY ABUNDANCE IN SENECA LAKE, NEW YORK,
Department of Environmental Conservation, Div. of Fish and Wildlife, Albany, NY.
T. M. Jolliff, D. Kosowski, C. Widmer, C. Creech, and E. Lantiegne.
May, 1981. 214 p, 2 Fig, 3 Tab, 13 Ref, 6 Append.

Descriptors: *Lakes, *Lamprey, *Fish toxins, *Chemical treatment, *Fish management, Fish populations, Poisons, Salmon, Trout, Fish stocking, Public participation, Ecosystems, Environmental protection, Seneca Lake, New York.

This Final Environmental Impact Statement presents an analysis of a proposal to use chemical lampricides to reduce sea lamprey abundance for five years in Seneca Lake in order to demonstrate benefits that would accrue to salmonid populations and the salmonid fishery, compared to Cayuga Lake which would be held as a no-treatment control. Lampricide TFM would be applied to Catharine Creek and the Keuka Lake Outlet, and lampricide Bayer 73 would be applied to 10-acre and 102-acre areas in Seneca Lake near the mouths of these streams. Some potential adverse impacts are that: (1) some non-target fish and amphibians could be killed, and some invertebrate organisms reduced; (2) there is potential for human exposure during applications; (3) a faint yellow color could appear in TFM-treated water until diluted or degraded; (4) there is potential risk to terrestrial earthworms if TFM-treated water is used for irrigation during treatment. The beneficial impacts anticipated include: (1) avoidance of the collapse of Seneca Lake lake trout population; (2) Collection of data to support informed decision-making on long-term sea lamprey control; (3) an improved salmonid survival rate leading to an increase in trout abundance; (4) enhancement of scientific knowledge of interactions between sea lampreys and salmonids; (5) documentation of a cost-benefit assessment of sea lamprey control; and (6) reduction of scars on host fishes by sea lampreys. (Garrison-Omniplan)
W81-05435

BENTHIC ECOSYSTEM AND FISH POPULATION OFF THE MOKAPU OUTFALL: A SECOND POSTINSTALLATION ECOLOGICAL STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
A. R. Russo, S. J. Dollar, and E. A. Kay.
Technical Report No 132, May, 1980. 45 p, 13 Fig, 8 Tab, 35 Ref.

Descriptors: *Effluents, *Wastewater outfall, *Ecological effects, *Benthic fauna, *Benthic flora, Aquatic habitats, Fish populations, Pollution effects, Mollusks, Algae, Baseline studies, On-site data collections, Oahu, *Hawaii.

Effluent discharge commenced at the Mokapu (Oahu, Hawaii) Outfall in December 1977. Five sites containing fish communities were monitored using SCUBA to assess the extent of changes in the environment near the sewage outfall. Results show little or no effect from the operation of the outfall on the benthic and fish communities two years after the commencement of the discharge. There are no sigificant differences in abundance, diversity, or composition of fishes from 1975 to 1979 except over the outfall site. Fish abundance there increased significantly, especially over the diffuser where the snapper Lutjanus kasmira was counted in large numbers (more than 500). The relative number of herbivorous fishes (acanthurids) increased near the outfall, perhaps in relation to an increased coverage of a microalgal mat and biomass of Lyngbya, a blue-green alga. The biomass of dominant macroalgae did not significantly change at any of the five sites. In comparison with samples in 1975 and 1978, the 1979 transect D samples and that from the diffuser show a lower overall abundance in micromolluscan assemblages, with an increase in relative proportions of Tricolia, Vitricithna, Rissoina miltozona, and Bittium at depths of 60-80 feet and at the diffuser. The differences reflect increasing numbers at greater depths, both of micro-mollusks more usually associated with depths of less than 50 feet and of species associated with frondose algae and substrata. (Garrison-Omniplan)
W81-05443

TOXIC AND TERATOGENIC EFFECTS OF SELECTED AROMATIC AMINES ON EMBRYOS OF THE AMPHIBIAN XENOPUS LAEVIS,
Oak Ridge National Lab., TN.
K. R. Davis, T. W. Schultz, and J. N. Dumont.
Archives of Environmental Contamination and Toxicology, Vol 10, No 3, p 371-391, 1981. 15 Fig, 6 Tab, 41 Ref.

Descriptors: *Toxicity, *Amphibians, *Aromatic compounds, Organic compounds, Embryonic growth stages, Industrial wastewater, Coal, Water pollution effects.

Appropriate disposal or treatment of the large volume of aqueous effluent produced has been a major environmental concern in the development of commercial scale use of coal conversion technologies. Effluents from bench and pilot scale coal conversion projects have been found to contain several classes of organic compounds, including many of the one, two, and three-ringed primary, secondary, and tertiary aromatic amines and some of their alkyl-substituted derivatives. This study used embryos of the amphibian Xenopus laevis to examine the toxic and teratogenic effects of four of the more common arylamines associated with aqueous coal conversion effluents. Acridine, aniline, pyridine, and quinoline were tested on Xenopus laevis embryos in the mid-blastulae, tailbud embryo, and swimming larvae stages of development. The 96-hour LC50 values for acridine, quinoline, aniline, and pyridine were 4.5, 95, 150, and 1090 milligrams per liter, respectively, for the swimming larvae. Tailbud embryos were less sensitive to all the amines except acridine than were the mid-blastulae or swimming larvae groups. The 96-hour EC50 values for mid-blastulae embryos exposed to acridine, quinoline, aniline, and pyridine were 2.4, 29, 370, and 1200 milligrams per liter, respectively. The swimming larvae were found to reach a maximum uptake of acridine within about 1 hour of exposure, with a rapid loss of about 70 percent of the total acridine occurring within 45 minutes during depuration. The test results indicate that acridine, aniline, and quinoline have toxic and teratogenic effects at sufficiently low concentrations to make them potential environmental hazards. (Carroll-FRC)
W81-05450

PRIMARY PRODUCTION AND BIOVOLUME OF VARIOUS PHOTOTROPHIC PLANKTON SIZE FRACTIONS IN THREE SOUTHEASTERN UNITED STATES RESERVOIRS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Biology.
D. L. Tison, and E. W. Wilde.
Applied and Environmental Microbiology, Vol 41, No 4, p 1055-1059, April, 1981. 1 Fig, 2 Tab, 17 Ref.

Descriptors: *Primary productivity, *Reservoirs, *Thermal pollution, *Cyanophyta, *Nuclear powerplant, Aquatic productivity, Lakes, Ponds, Water pollution effects, Temperature effects, Algae, Plankton, Phytoplankton, *South Carolina.

The relative contribution of picoplankton (3.0 to 0.2 microns in diameter) to the overall primary productivity was measured in three reservoirs of the Savannah River drainage basin of South Carolina. In situ primary production measurements were made at Clark Hill Lake, Pond C, and Par Pond, the latter two of which receive thermal effluent from a nuclear production reactor. Water samples were collected and filtered through Nuclepore membrane filters, and subsamples were analyzed for BOD, radioactivity, and algal and cyanobacterium content. Microorganisms were examined by both phase contrast and epifluorescent microscopy. Filtrates of < 2 microns from Pond C and Par Pond and < 3 microns from Clark Hill Lake showed that cyanobacteria were the dominant phototrophs in these cell fractions. Except in the Pond C samples, picoplankton generally comprised about 1% of the total biovolume. Picoplankton fractions (< 2 microns) from Pond C and Par Pond accounted for 16 to 33% of the primary production in July, while in December, when the ecosystem was exposed to thermal effluent, the $<$ 3 micron fraction accounted for 30-40% of the total plankton primary production. These findings show that, although picoplankton represent a small portion of the phototrophic biovolume, they significantly contribute to the primary production of the reservoirs studied. (Geiger-FRC)
W81-05452

EFFECT OF TEMPERATURE ON GROWTH AND ACTIVITY OF AEROMONAS SSP. AND MIXED BACTERIAL POPULATIONS IN THE ANACOSTIA RIVER,
Maryland Univ., College Park. Dept. of Microbiology.

For primary bibliographic entry see Field 5B.
W81-05453

FOSSIL DIATOM ASSEMBLAGES AFTER EUROPEAN SETTLEMENT FROM FOUR LAKES IN LAKE AND NEWAYGO COUNTIES, MICHIGAN (USA),
Oregon State Univ., Corvallis. School of Oceanography.
G. Schuette, and R. E. Bailey.
American Midland Naturalist, Vol 103, No 2, p 322-332. April, 1980. 5 Fig, 33 Ref.

Descriptors: *Lakes, *Eutrophication, *Diatoms, *Lumber industry, Geologic history, Land use, Ecosystems, *Michigan.

Stratigraphic changes in the post-European settlement diatom flora of lakes in or near Manistee National Forest, Michigan, were documented, and water quality changes were related to natural or cultural eutrophication. In Lake Fremont, an increase in numbers of diatoms was correlated with the time of European settlement, but there was no such correlation in Lakes Howe, Stowell or Hungerford. There was a continuous decline in absolute numbers from the pre-European settlement levels in these shallower lakes. The low numbers in surface samples from all lakes reflected gradually restricted land use after the lumbering era. Interpretation of the diatom profiles for Howe and Stowell Lakes included accelerated eutrophication after European settlement, with some indication of a decline in land use affecting water quality after 1940. Hungerford, which is located far from lumbering centers and is now in a protected area, showed no dramatic floral changes. The profile for Lake Fremont included a change in diatom assemblages which was clearly caused by human influence. There is intensive lumbering and agriculture in the area, as well as recreational and municipal use. (Small-FRC)
W81-05505

CONTINUOUS DO SIMULATION AT SPRINGFIELD, MISSOURI,
CH2M/Hill, Inc., Gainesville, FL.
J. E. Scholl, and R. L. Wycoff.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 69-82, February, 1981. 7 Fig, 7 Tab, 12 Ref.

Descriptors: *Dissolved oxygen, *Storm runoff, *Simulation, Water pollution sources, Mathematical models, Fishkills, Effluents, Wastewater treatment, Wastewater facilities.

Receiving water impact studies on the James River were conducted near Springfield, Missouri, to estimate the cost for controlling stormwater-induced pollution nationwide. A simulation of James River dissolved oxygen concentrations was calibrated to continuous in-stream dissolved oxygen measurements collected by the US Geological Survey. The calibrated model was then used to simulate impact of an advanced wastewater treatment facility in Springfield and to evaluate the impact of urban stormwater alternatives. The simulations indicated that stormwater pollution had not caused fishkills. The low dissolved oxygen levels on the river were probably due to some combination of resuspension of dry-weather benthic deposits, poor quality secondary effluent, and infiltration and inflow into the Springfield system. Future fishkills will probably be avoided due to the construction of a new wastewater treatment plant. (Small-FRC)
W81-05533

METHANOGENESIS IN THERMAL REACTOR EFFLUENTS,
Illinois Natural History Survey, Urbana.
R. W. Gorden, and C. B. Fliermans.
Journal of Thermal Biology, Vol 5, No 3, p 169-177, 1980. 3 Fig, 5 Tab, 23 Ref.

Descriptors: *Thermophilic bacteria, *Thermal water, *Methane, *Cooling ponds, Wastewater treatment, Bacteria, Methane bacteria, Algae, Biodegradation, Solid wastes, Savannah River Plant, Powerplants, Thermal discharges, *Nuclear powerplants.

The ponds and streams in the Savannah River nuclear plant closed-loop cooling water system were the site of methanogenesis studies. Gases were collected over a 90-day period. Pond 1, sediment temperature 61C, produced 192-328 cu cm per sq meter per day methane and Pond 2, sediment temperature 37C, 116-380 cu cm per sq meter per day methane. During a selected mid-experiment period, Pond 1, 61C and greater, averaged 329 cu cm per sq meter per day and Pond 2, 37C, 174 cu cm per sq meter per day. Pond 3, 50-55C, contained little organic substrate and produced an average 49.7 cu cm per sq meter per day methane. Pond 4, 55C, produced no methanogenesis in 5 weeks' study. Separate sampling at temperatures from 22-65C showed the methane levels in the gases collected as follows: Pond 1, 53-83%; Pond 2, 45-70%; and Pond 4, 48-77%. Laboratory experiments using sediments taken from lake sites showed optimum temperature for methanogenesis was 65-70C out of the range 30-75C. Thermophilic processing of solid wastes might be more effective if heat-adapted organisms are used and if facilities are located in the vicinity of a thermal effluent system. (Cassar-FRC)
W81-05555

POTENTIAL FOR BALDCYPRESS ESTABLISHMENT IN THERMALLY ALTERED STREAMS,
Savannah River Ecology Lab., Aiken, SC.
C. Sherrod, Jr., D. E. Somers, and K. W. McLeod.
Journal of Thermal Biology, Vol 5, No 2, p 107-111, 1980. 3 Fig, 2 Tab, 10 Ref.

Descriptors: *Cooling water, *Thermal tolerance, *Cypress, Germination, Growth, Trees, Water pollution effects, *Thermal pollution, *Nuclear reactors, Thermal discharges, Steel Creek, South Carolina, *Savannah River Plant.

Although the Steel Creek, near the Savannah River nuclear reactor plant, has not received thermal effluent since 1968, the bald cypress forest has not recovered. In situ experiments with baldcypress seeds revealed that germination occurs in streams with water temperatures up to 42C, but seedling survival was poor at temperatures higher than 45C. Root biomass was proportionately less in higher temperature locations than at lower temperature locations. Germinations at 3 depths in laboratory studies were 20-25% at 31.4C, 8.3-10.6% at 35.8, and 3.3-26.7% at 39.9C. Seedling survival was very poor in laboratory studies, 9.7, 5.1, and 5.6 days in the ambient, warm, and hot environments, respectively. Possible causes for Steel Creek's failure to reforest with cypress are (1) nonexistence of a seed pool, (2) variation in water level, and (3) competition from plants growing from wind-dispersed seeds. (Cassar-FRC)
W81-05556

THERMAL EFFECTS,
Oak Ridge National Lab., TN.
S. S. Talmage, and C. C. Coutant.
Journal of the Water Pollution Control Federation (Literature Review Issue), Vol 52, No 6, p 1575-1616, June, 1980. 400 Ref.

Descriptors: *Thermal pollution, *Temperature, *Aquatic life, *Aquatic animals, *Powerplants, Fish, Water cooling, Water pollution effects, Heated water, Water temperature, Environmental effects, Lakes, Reservoirs, Streams, Rivers, Bacteria, Marine animals, Estuaries, Growth rates, Plankton, Reproduction, Invertebrates, Embryonic growth stage, Larval growth stage, Insects, Oxygen requirements, Literature review.

A review of 1978-1979 literature on the effects of thermal water pollution on aquatic life first discusses several books, general reviews, and modeling studies. Examinations of individual sites (lakes, reservoirs, streams, rivers, and the Great Lakes) document the effects of heated water from power plant cooling water. Many types of aquatic animals are affected by thermal pollution, with effects in each case determined by species, age, temperature of the water, and whether laboratory or on site study. The effects of temperature on embryonic development on larval development of aquatic fauna, on distribution of animals, on metabolism and on growth, as well as the interaction of temperature and other stresses, temperature preference, and thermal tolerance have been studied. (Cassar-FRC)
W81-05559

SOILS LOSS AND MICROBIOLOGICAL QUALITY OF RUNOFF FROM LAND TREATED WITH POULTRY LITTER,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
J. Giddens, and A. P. Barnett.
Journal of Environmental Quality, Vol 9, No 3, p 518-520, July/September, 1980. 3 Fig, 1 Tab, 10 Ref.

Descriptors: *Animal wastes, *Land disposal, Water quality, Soil erosion, Runoff, Erosion, Coliforms, Water pollution, Manure, Farm wastes, Fertilizers, *Poultry litter.

The possible pollution hazards were determined from using poultry litter on sloping land. The effect of poultry litter on soil erosion was also evaluated. A rainfall simulator was used to study the effect of application on runoff water quality and soil loss on moderately sloping (7%) land. Increasing rates of litter were surface-applied on fallow soil and grassland and also incorporated into the fallow soil. Runoff and soil loss were drastically reduced by litter application on fallow soil, and runoff was reduced on the grassed soil. The grassed soil had little soil loss with or without litter application. The coliform bacterial content of runoff water from plots receiving the higher application rates of surface applied litter was appreciable. Incorporating litter into soil generally reduced coliforms during the later stages of runoff. Moderate applications of poultry manure to sloping land should not create a major water quality problem unless excessive rainfall occurs. (Baker-FRC)
W81-05562

THE INFLUENCE OF ORGANIC WASTES AND INORGANIC NITROGEN SOURCES ON SOIL NITROGEN, YIELD, AND ELEMENTAL COMPOSITION OF CORN,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W81-05563

FATE AND TOXICITY OF ACEPHATE (ORTHENE) ADDED TO A COASTAL B.C. STREAM,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W81-05593

EFFECTS OF PHENOLIC COMPOUNDS ON IN VIVO BLOOD PARAMETERS OF A FISH NOTOPTERUS NOTOPTERUS,
D.A.V. Coll., Muzaffarnagar (India). Pollution Relevant Research Lab.
S. R. Verma, S. Rani, and R. C. Dalela.
Journal of Environmental Science and Health, Part B, Vol 16, No 3, p 273-282, 1981. 2 Tab, 27 Ref.

Descriptors: *Fish, *Blood, *Phenols, Phenolic pesticides, Dinitrophenol, Pentachlorophenol, Water pollution effects, *Pesticides, Bioindicators.

The effects of phenol (P), dinitrophenol (DNP), pentachlorophenol (PCP), and combinations were determined on several blood parameters using Notopterus notopterus as test fish. The combinations were (PCP+DNP)/P (most antagonistic), (DNP+P)/PCP (most additive), and (P+DNP)/PCP (most synergistic). Exposures were subacute, one-tenth, one-fifteenth, and one-twentieth fractions of the 96 hour LC50 for 30 days. Generally, red blood cell count, white blood cell count, and packed cell volume increased, and clotting time, erythrocyte sedimentation rate, hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and mean cell volume de-

creased. PCP showed dual effects in many cases. Clotting time and mean cell volume decreased in PCP alone and in (DNP+P)/PCP combinations, but increased in (P+DNP)/PCP combinations. Hemoglobin increased in (DNP+P)/PCP and (P+DNP)/PCP combinations and decreased in PCP alone. These findings proved reliable enough for use as laboratory diagnostic indices by persons involved in fish management and water pollution control. (Cassar-FRC)
W81-05594

BEHAVIOR OF CHROMIUM IN SOILS: IV. TOXICITY TO MICROORGANISMS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
D. S. Ross, R. E. Sjogren, and R. J. Bartlett.
Journal of Environmental Quality, Vol 10, No 2, p 145-148, 1981. 3 Tab, 10 Ref.

Descriptors: *Chromium, *Toxicity, *Soil bacteria, Sludge, Sludge disposal, *Microorganisms, Nitrification, Industrial wastes.

The toxicity of chromium, frequently found in waste sludges, to soil bacteria isolates was investigated by measuring the turbidity of liquid cultures supplemented with Cr(VI) or Cr(III). Isolates growing in a soil-extract medium or in a semisynthetic medium were inhibited by 10 to 12 ppm of Cr(VI). Gram negative bacteria were more sensitive than gram positive types. There was no toxicity due to Cr(III) at these levels. In soil tests, Nellis loam and Hinesburg fine sandy loam samples were treated with 10 and 100 ppm Cr(VI) and 100 ppm Cr(III). All three levels of chromium significantly decreased carbon dioxide evolution during the three week experiment. Extractable Cr(VI) in the soils decreased rapidly, indicating that there was a reduction in Cr(VI). The toxic effects of Cr(VI) to gram negative bacteria may indicate that soil microbial transformations such as nitrification are affected. Since Cr(II) and Cr(VI) both inhibited microbial activity in soil, caution should be used in disposal of Cr-containing wastes. (Small-FRC)
W81-05656

5D. Waste Treatment Processes

FILTRATION OF HOT WATER EXTRACTION PROCESS WHOLE TAILINGS,
Petro-Canada Exploration Inc., Calgary (Alberta).
J. K. Liu, S. J. Lane, and L. M. Cymbalisty.
U.S. Patent No 4,225,433, 6 p, 2 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1883. September 30, 1980.

Descriptors: *Patents, *Wastewater treatment, *Industrial wastes, *Separation techniques, Suspended solids, Flocculation, Filtration, Tar sand deposits, Hot water extraction processes, Vacuum filtration.

The invention relates to a process for treating whole tailings from a hot water extraction process plant with the object of separating the water, contained in the tailings, from the greatest part of the contained solids. The process is used commercially in two very large plants to extract bitumen from the tar sand deposits. The invention provides a method of treating combined whole tailings from a hot water extraction process plant. The tailings include water, and coarse and fine solids. The method comprises mixing the tailings with a flocculating agent to agglomerate fine solids with coarse solids whereby the fine solids co-settle with the coarse solids; and then vacuum filtering the product to separate the water and solids. (Sinha-OEIS)
W81-05415

WASTE WATER TREATMENT,
Lakeside Equipment Corp., Bartlett, IL. (Assignee).
A. P. Malm.
U.S. Patent No 4,226,717, 6 p, 3 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 252. October 7, 1980.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, Organic wastes, Oxidation, Equipment, Flow, Grit removal.

The object of the invention is to provide a new and improved waste water treament system including a combined oxidation and grit removal means. The structure defines an elongated, closed loop path for the flow of waste water within the vessel. One or more rotors direct waste water along the path and introduce oxygen into the waste water within the vessel. An elongated grit chamber is placed within the vessel and has an inlet and an outlet. They are spaced from each other along the flow path and there is provided a further inlet for introducing raw waste water. (Sinha-OEIS)
W81-05416

PROCESS AND APPARATUS FOR THE TREATMENT OF AQUEOUS WASTE MATERIALS,
PepsiCo, Inc., Purchase, NY. (Assignee).
H. C. De Longe.
U.S. Patent No 4,225,431, 10 p, 4 Fig, 8 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1882-1883. September 30, 1980.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, *Industrial wastes, Biological treatment, Oxidation, Recycling, Aeration, Biochemical oxygen demand, Equipment, Bottling plants, Backwashing.

A process and apparatus is provided for the treatment of aqueous waste materials or effluents, particularly the aqueous waste materials of bottling plants and installations, in which a trickling element is employed for the basic rough processing to effect the removal of biological oxygen demand (BOD). The trickling element is constituted of a trickling tower filled with a filter media formed of a plastic material on which biological growth forms to degrade BOD. The invention utilizes sequential physical-chemical aeration processes following the rough processing. The discharge stream of effluent is then conveyed into an oxidation-reaction tank, providing for the chemical oxidation of light organic floc resulting from biological action and for further BOD reduction, and for the oxidation of any biomass sloughing off the element media. The trickling tower may also be adapted to continuously receive recycled portions of the effluent from the oxidation-reaction tank. The oxidation-reaction tank provides for a circuitous flow path for the effluent with the addition of an oxygen-bearing gas, such as ozone to enhance the rate of oxidation of the effluent. The oxidation-reaction tank is enclosed and maintained under a pressure higher than atmospheric. (Sinha-OEIS)
W81-05419

METHOD AND APPARATUS FOR TREATING WATER CONTAINING WASTES,
Nihon Automatic Machinery Mfg., Co. Ltd., (Japan). (Assignee).
T. Kamei.
U.S. Patent No 4,226,712, 6 p, 2 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 251. October 7, 1980.

Descriptors: *Patents, *Wastewater treatment, *Industrial wastes, Organic wastes, Inorganic wastes, Odor, Alkaline earth metals, Fertilizers, Equipment, *Odor control.

A method and apparatus treats a water containing waste such as industrial sludges and animal excrements. The method comprises mixing the waste with an alkaline earth metal oxide such as calcium oxide to obtain a preliminarily dried mixture and then further drying and granulation of the mixture. The apparatus comprises a reactor for the mixture, a drying kiln equipped with a stirrer, a furnace surrounding the drying kiln and an exhaust collector adapted to collect an exhaust gas from the reactor and drying kiln and transfer it to the furnace. Fuel consumption is saved by utilization of the exothermic reaction of an alkaline earth metal oxide with water contained in the waste. The waste may be converted by the method to usable products such as fertilizers, cement materials or cement additives. The apparatus is so designed to overcome the problems of an offensive odor produced during processing and at the same time to minimize a loss of heat during the transportation of the mixture from the reactor to the drying kiln. (Sinha-OEIS)
W81-05425

PROCESS FOR SEPARATING POLYVINYL ALCOHOL FROM ITS SOLUTION,
Shikibo Ltd., Osaka (Japan). (Assignee).
T. Yamagata, and S. Banno.
U.S. Patent No 4,226,718, 9 p, 3 Fig, 14 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 253. October 7, 1980.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, Industrial wastes, Separation techniques, Chemical precipitation, Coagulation, Bubbles, Equipment, Polyvinyl alcohol (PVA).

This invention relates to a process for separating polyvinyl alcohol (PVA) from its solution which comprises adding a salt of boric acid and an inorganic acid salt of a metal selected from the class consisting of the first group and the second group in the periodic table, an inorganic ammonium salt, or an aluminum salt to an aqueous PVA solution. It is desirable in carrying out the invention that a great number of minute foams are present in the precipitates of PVA formed by adding the coagulating agent. The foams, or finely divided gas bubbles suspended in a liquid, may be introduced into the aqueous solution either by bubbling air into the solution or by agitating the solution vigorously. A further contrivance is needed for separating PVA in a continuous system. A stirring vessel is provided with obstructing plates and a stirrer, the obstructing plates being protruded from the wall of the vessel to the center of the vessel, the stirrer having an axis provided with blades in symmetrical relation around the axis. The stirrer is rotated so that the blades and knives cut PVA masses precipitated from the solution to fine particles. (Sinha-OEIS)
W81-05426

BIOLOGICAL PROCESS,
African Explosives and Chemical Industries Ltd., Johannesburg (South Africa). (Assignee).
J. Bosman.
U.S. Patent No 4,225,430, 5 p, 1 Fig, 8 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1882. September 30, 1980.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, *Biological treatment, *Denitrification, Ammonia, Carbon, Recycling, Equipment, Molasses, Fluidized bed reactor.

The invention consists of feeding to a reactor a feed of high-nitrogen content waste water effluent together with denitrifying bacteria and a carbon source (molasses) for a period of time sufficient to substantially denitrify the effluent; and passing into the reactor a recycle stream which is substantially denitrified effluent back into the reactor. The ratio of recycle stream to feed ranges from 2 to 200 and the linear velocity of the recycle through the reactor is high enough to remove continuously some of the biomass from the medium and thereby establish a balance between bacterial growth rate and biomass wash off. The linear velocity can be controlled to optimize hydraulic retention times in the reactor containing the denitrification medium by employing carbon sources which support maximum denitrification rates. (Sinha-OEIS)
W81-05428

EXPLORATION CAMP WASTEWATER CHARACTERIZATION AND TREATMENT PLANT ASSESSMENT,
D. T. Trinh.
Environment Canada, Environmental Protection Service Technology Development Report EPS 4-WP-81-1, February, 1981. 54 p, 16 Fig, 6 Tab, 2 Ref, 3 Append.

Descriptors: *Wastewater treatment, *Mixed liquor solids, *Quebec, *Aerobic treatment, Acti-

vated sludge process, Feasibility study, Suspended solids, pH, Dissolved oxygen, Oxygen uptake, *Oxyvor, Rotating biological contactor, James Bay, Hudson Bay.

Wastewater generated at the camp operated by Hydro Quebec was characterized and the performances of an activated sludge process (Oxyvor) and a rotating biological contractor (RBC) treating the wastewater were addressed. The treatment units were operated in parallel throughout the program. Twenty-four-hour composit samplers were analyzed for total BOD 5, COD, and TSS. The suspended solids concentration, pH, DO, oxygen uptake rate, temperature, and sludge volume index of the Oxyvor mixed liquor were measured daily. For the RBC, pH and liquid temperature were measured daily. Ambient temperature in the building housing the systems was also recorded daily. Results of the study show that the RBC could withstand diurnal flow deterioration of effluent quality was observed but the effluent remained at a level of acceptable quality. The performance of the Oxyvor system was poor. Often affected by the frequent wash out of the mixed liquor suspended solids it produced very erratic and unacceptable effluent for the duration of the study. (Madden-IPA)
W81-05432

EFFECT OF FLOW EQUALIZATION ON WATER POLLUTION CONTROL PLANT PERFORMANCE.
Environment Canada, Canada Mortgage and Housing Corporation Sewage Collection and Treatment Report SCAT-4, December, 1980. 73 p, 31 Fig, 14 Tab, 6 Ref, 1 Append.

Descriptors: *Flow equalization, *Water pollution control, *Biological oxygen demand, Primary clarifier, Secondary clarifier, Primary effluent, Secondary effluent, Non-equalized flow, Pumped sludge, Stouffville Water Pollution Control Plant, Environmental Protection Service, Wastewater Technology Research Program, *Wastewater treatment, Biological solids concentration, Phosphorus removal, Municipal wastewater, Hydraulic loading, Flow conditions, Bypass flow.

The Canada Mortgage and Housing Corporation of Ottawa, Ontario, Canada, engaged Dearborn Environmental Consulting Services to perform a study of the effects of flow equalization at the Stouffville Water Pollution Control Plant. The study was conducted during the fall of 1976 (low flow conditions) and the spring of 1977 (high flow conditions), to determine whether the addition of an equalization tank could reduce or eliminate instantaneous peak loading. Peak loading which exceeds design capacity can result in clarifier bypass and consequent deterioration of effluent quality to below the standards required by current water pollution control legislation. With equalized flow, average total biological oxygen demand (BOD) was reduced from 28 mg/l to 13 mg/l, and suspended solids were reduced from 28 mg/l to 16 mg/l. Average daily loading could be increased by 15 percent without deterioration of secondary effluent. The equalization tank functioned as a primary clarifier, removing 7.2 kg of solids and 1.2 kg of BOD per 1000 cu m of sewage, and reducing loading on the receiving water body during bypasses of the treatment system. (Mullen-IPA)
W81-05433

TOXICITY EVALUATION OF EFFLUENTS FROM THE WASTEWATER TREATMENT SYSTEM AT DSM'S CHEMICAL PLANT IN HOLLAND,
Waste Water Technology Centre, Ottawa (Ontario).
V. W. Cairns, K. Conn, B. E. Jank, and A. M. R. van den Bruel.
Technology Development Report EPS 4-WP-81-2, February, 1981. 34 p, 6 Fig, 8 Tab, 6 Ref, 4 Append.

Descriptors: *Wastewater treatment facility, *Identification, *Bioassay, *Holland, *Dutch State Mines, *Ontario, Phenols, Ammonia, Statistical analysis, Chemical analysis, Organic chemicals, Trout, Guppies, Golden orfe, Toxicity, Test solutions, Federal Republic of Germany, Hydrogen ion concentration.

NV Dutch State Mines, (DSM) Holland, and the Environmental Protection Service of Environment Canada cooperated in a study to evaluate the toxicity reduction capability of the wastewater treatment system for the organic chemical plant at Geleen, Holland. The objective of the study was to evaluate the performance of the suspended growth biological system at DSM as input for identification of BPT for the Canadian organic chemical industry. Because the new treatment plant was not operating, the evaluation was performed on effluent samples from a pilot plant having a flow capacity of 15 cu m times h to the (-1) power (55 Igpm). Phase 1 of the study was a preliminary screening program designed to establish the effects of storage time and temperative. Phase 2 was a bioassay program in which 18 samples were collected over 4 weeks. All untreated effluent samples were acutely lethal to fish. Phase 1 demonstrated that no significant change in acute toxicity or chemical composition occurred in wastewater subjected to 48 h nonrefrigerated storage. In Phase 2, the effluent samples from the treatment system showed no acute toxicity. It was concluded that the new treatment system at the DSM plant will eliminate the toxic elements in the wastewater. (Madden-IPA)
W81-05434

EVALUATION OF WASTEWATER FILTRATION,
Utah Water Research Lab., Logan.
B. L. Bench, E. J. Middlebrooks, D. B. George, and J. H. Reynolds.
Water Quality Series UWRL/Q-81/01, January, 1981. 49 p, 30 Fig, 27 Tab, 29 Ref, 2 Append.

Descriptors: *Tertiary wastewater treatment, *Dual media filters, *Filtered wastewater, Sand filters, Suspended solids, Advanced wastewater treatment, Gravity filters, Biochemical oxygen demand, Complete wastewater treatment, Hydraulic loadings, Filtration, Effluent, Wastewater treatment.

Frequently it is necessary to utilize advanced treatment processes to improve the overall performance of wastewater treatment plants. Tertiary filtration of wastewater secondary effluent is one such treatment process. Four filter columns were operated at the wastewater treatment plant in Preston, Idaho to examine the effectiveness of granular media, gravity filtration to remove biochemical oxygen demand particles (BOD5), soluble BOD5, and suspended solids. The Preston plant produces a secondary effluent utilizing a trickling filter for the biological treatment process. Anthracite coal, silica sand, and garnet sand were the granular materials used as filter media. Mixed media, dual-media, and single-media beds were constructed with the following media configurations: (1) coal-sand-garnet, (2) coal-sand, (3) sand-garnet, and (4) all sand. The filters were operated at two hydraulic loading rates and a mathematical equations was developed to calculate the filter performance in removing total BOD5. The quality of filter influent affected the quality of filter effluent. Typical total BOD5 and suspended solids removal efficiencies were 30 percent and 75 percent, respectively. Soluble BOD5 was not significantly removed by granular filtration. The four filter beds were equally effective in removing suspended solids and BOD. (Garrison-Omniplan)
W81-05438

MODELING OF ROTATING BIOLOGICAL CONTACTOR SYSTEMS,
Pittsburgh Univ., PA. Dept. of Civil and Environmental Engineering.
Y-C. Wu, E. D. Smith, and Y. T. Hung.
Biotechnology and Bioengineering, Vol 22, No 10, p 2055-2064, 1980. 2 Fig, 3 Tab, 25 Ref.

Descriptors: *Biological treatment, *Biological oxygen demand, *Wastewater treatment, Hydraulic loading, Temperature, Stage treatment, Model studies, Mathematical models, Regression analysis, *Industrial wastewater.

A mathematical model for BOD removal from domestic and low strength industrial wastewaters using rotating biological contactors was developed from literature data and multiple regression analysis. The most significant variables in predicting the system's performance were influent BOD concentrations, hydraulic loading, stage number, and wastewater temperature. Other variables investigated were flow rate, disk surface area, disk rotation speed, and liquid retention time. When the initial BOD concentration is less than 355 mg per liter, the fraction of BOD remaining in the effluent is directly related to hydraulic loading and inversely related to influent BOD concentration, wastewater temperature, and stage number. This model predicted effectiveness of BOD removal more accurately than did the Weng model. (Cassar-FRC)
W81-05457

METHANE PRODUCTION FROM WASTEWATERS BY IMMOBILIZED METHANOGENIC BACTERIA,
Tokyo Inst. of Tech. (Japan). Research Lab. of Resources Utilization.
I. Karube, S. Kuriyama, T. Matsunaga, and S. Suzuki.
Biotechnology and Bioengineering, Vol 22, No 4, p 847-857, 1980. 8 Fig, 2 Tab, 11 Ref.

Descriptors: *Methane, *Bacteria, *Organic wastes, Gels, Agars, *Wastewater treatment, *Methane production, Carbohydrates, Industrial wastes, Organic acids, Biodegradation.

Methanogenic bacteria were immobilized onto carriers to convert organic matter in wastewater to methane. Agar gel was the best carrier, producing 450 micromoles methane per gram dry cells per hour compared with polyacrylamide, 60, and collagen, zero. Optimum conditions for methane production were 1.5-3% concentration agar gel, 20 mg wet cells of bacteria per g gel, pH 7.0-7.5, temperature 37-45C. The immobilized whole cells had an initial production rate of 1.8 micromoles per g gel per hour, increasing to a steady state, 4.5 micromoles per g gel per hour, after 25 days incubation. Storage for 3 months at 5C in 0.1 M phosphate buffer (pH 7.0) did not affect methane production rate. Although the presence of oxygen gradually decreased methanogenesis to zero in 12 hour's incubation of free cells, the immobilized cells continued methane production at the same rate for the duration of the experiment. Carbohydrates in wastewaters from an alcohol fermentation factory (360 mg per liter glucose and 540 mg per liter sucrose) were completely decomposed to organic acids by immobilized bacteria. Acetic, propionic, and butyric acids remained. (Cassar-FRC)
W81-05458

EXERCISING THE DEEP SHAFT OPTION IN PORTAGE LA PRAIRIE,
T. Bhagat.
Water and Pollution Control, Vol 119, No 4, p 18-19, April, 1981. 3 Fig.

Descriptors: *Secondary wastewater treatment, *Deep shaft process, *Aeration, Biological wastewater treatment, Wastewater treatment, Flotation, Portage la Prairie, Canada, Clarifiers.

A deep shaft secondary wastewater treatment system is scheduled to start up in Portage la Prairie, Canada, in spring, 1981. The system incorporates a closed reactor built in a vertical plane and a surface flotation clarifier. There are two aeration shafts, 450 feet deep, working in parallel. Plant capacity is 5,443 kg BOD5 daily at average dry weather flows. This plant conserves energy and space, requiring 0.275 acres compared with five acres for a conventional plant. The air, introduced at 125 psig, serves three functions: mixing, oxidation, and flotation. (Cassar-FRC)
W81-05459

THERMAL SLUDGE CONDITIONING AT ASHBRIDGES BAY.
Water and Pollution Control, Vol 119, No 4, p 12-13, April, 1981. 2 Fig.

Descriptors: *Sludge conditioning, *Waste heat, Thermal sludge conditioning, Steam, Zimpro process, Ashbridge Bay plant, Toronto.

The world's largest installation for thermal conditioning of wastewater sludge is in startup at the Ashbridge Bay plant, Toronto. Using the Zimpro process, the plant is designed to process 1,400 imperial gallons per hour of primary waste activated and digested sludge. This system uses seven wet air oxidation units (one is a standby) and a waste heat recovery system designed to produce 10,000 pounds of steam per hour at 500 psig. The entire operation is designed for closed-loop, fully-automated computer operation. Thermal-conditioning the sludge improves its thickening and dewatering characteristics. After gravity thickening and coil vacuum film dewatering, it is incinerated. (Cassar-FRC)
W81-05460

OZONE GIVES BOOST TO ACTIVATED CARBON,
Jacobs Engineering Group, Washington, DC.
R. G. Rice.
Water and Sewage Works, Vol 127, No 4, p 40, 41, 78, 80-82, April, 1980. 2 Fig, 3 Tab, 16 Ref.

Descriptors: *Wastewater treatment, *Ozonation, Ozone, Activated carbon, Absorption, Biodegradation, Carbon, Adsorbents.

Pilot studies conducted in Europe have indicated that preozonation followed by activated carbon adsorption increases the capacity of the carbon to remove organics, increases the operating life of the carbon columns, permits biological oxidation of ammonia in the inert media and GAC columns, and allows the use of less ozone or less GAC for removing a given amount of organics than using either process alone. Two mechanisms have been proposed by which biological activity in the biological-activated carbon (BAC) media can be used. According to one mechanism microorganisms are present in the larger activated carbon pores near the outer surface. Dissolved organics are adsorbed at the surface or in the larger pores and are biodegraded as rapidly as they would be in a biologically active sand filter. In the second mechanism the organics are adsorbed by the small pores where bacteria are absent, and desorption occurs slowly. In determining what process to use, raw water samples should be analyzed for COD and biodegradable materials, then oxidized, ozonized, and the COD and biodegradable materials again analyzed. The larger the ratio of biodegradable material to COD after oxidation, the more effective will be the BAC process. (Baker-FRC)
W81-05464

THE LOCATION AND NATURE OF ACCUMULATED PHOSPHORUS IN SEVEN SLUDGES FROM ACTIVATED SLUDGE PLANTS WHICH EXHIBITED ENHANCED PHOSPHORUS REMOVAL,
Johannesburg City Health Dept. (South Africa).
L. Buchan.
Water S. A., Vol 7, No 1, p 1-7, January, 1981. 13 Fig, 1 Tab, 11 Ref.

Descriptors: *Phosphorus, *Activated sludge, *Electron microscopy, X-rays, Activated sludge process, *Wastewater treatment, Accumulation.

Electron microscopy and energy dispersive analysis of x-rays were used to investigate the mechanism which causes the activated sludge process to remove significant quantities of phosphorus in excess of normal metabolic requirements. The location and nature of the stored phosphorus were identified. The seven activated sludges examined had phosphorus accumulations in identical intracellular structures. The intracellular electron-dense bodies were determined not to be any form of calcium phosphate precipitate by the calcium to phosphorus x-ray intensity ratio. No extracellular phosphorus-containing precipitates were located. It is possible that any such precipitates were solubilized during the preparation of samples. A biological mechanism of enhanced phosphate uptake was indicated by the number of polyphosphate accumulating cells in the sludges and by the vast quantities of phosphorus within these cells. (Small-FRC)
W81-05465

MIXING CHARACTERISTICS OF A HIGH-RATE ALGAE POND,
Cape Town Univ. (South Africa). Dept. of Chemical Engineering.
S. B. Miller, and H. O. Buhr.
Water S. A., Vol 7, No 1, p 8-15, January, 1981. 6 Fig, 1 Tab, 18 Ref.

Descriptors: *Mathematical models, *Flow, *Oxidation pond, *Algae, Reynolds number, Mixing, Ponds, Wastewater treatment, Mathematical studies.

Impulse-response tests were carried out on an experimental pond as part of the development of a mathematical model for the flow and mixing characteristics of a high-rate algae pond. The tests were performed at a Reynolds number of 10 to the 5th power and on two scale models of the same pond at $2000 < Re < 20{,}000$. Each pond was a continuous rectangular channel with seven 180 deg bends, and was mechanically recirculated. The type of pond investigated was well characterized by a dispersed plug-flow model with dispersion numbers in the range of 0.003 to 0.017 and by a tanks-in-series model. Dispersion intensities were correlated by a modified dispersion number for depth to width ratios in the range 0.18 to 0.76. The dispersion coefficient was determined under a variety of operating conditions by fitting the results of tracer studies to a dispersed-plug-flow model of the continuous channel system. (Small-FRC)
W81-05466

NUMERICAL ANALYSIS OF FLOW IN SEDIMENTATION BASINS,
Utah Univ., Salt Lake City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W81-05481

OPTIMIZATION OF CHLORINE DISINFECTION EFFICIENCY,
California State Dept. of Health Services, Berkeley.
E. Sepp.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 139-153, February, 1981. 5 Fig, 7 Tab, 8 Ref.

Descriptors: *Chlorination, *Optimization, *Systems analysis, Pilot plants, Water treatment, Performance evaluation, Toxicity, Bioassays, Wastewater facilities.

A research project to demonstrate that it is possible to obtain savings in chlorine and reductions in toxicity by improved chlorination system design was conducted by the California State Department of Health Services. Parallel studies were performed at selected secondary sewage treatment plants using a mobile chlorination pilot plant of optimized design. The pilot plant design included the rapid initial mixing of chlorine solution and wastewater, reliable automatic chlorine residual control, and adequate contact time in a plug flow type contact tank. Flow-through fish bioassays were performed on three effluent streams. The optimized pilot plant used significantly less chlorine and had lower effluent chlorine residuals than full-scale plants which were also evaluated. The optimum design and operation saved up to 50% in chlorine use. Pilot plant effluents were significantly less toxic to fish, but complete elimination of chlorine-induced toxicity was not possible through optimum design alone. Sulfur dioxide removed all chlorine-induced toxicity from the effluents. (Small-FRC)
W81-05486

INDUSTRIAL REUSE OF URBAN STORMWATER,
Environmental Protection Agency, Edison, NJ.
For primary bibliographic entry see Field 3C.
W81-05488

VERIFICATION OF OCEAN OUTFALL PERFORMANCE PREDICTIONS,
Caldwell Connell Engineers, Ltd., Melbourne (Australia).
I. G. Wallis.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 421-425, April, 1981. 2 Fig, 8 Ref.

Descriptors: *Outfall sewers, *Computer models, *Wastewater disposal, Wastewater outfalls, Model studies, Performance evaluation, Plumes, Entrainment.

The measured performance of full-scale ocean outfalls is compared with that predicted using a computer model and the commonly used entrainment coefficients derived from the results of laboratory experiments. Field measurements were made of initial effluent dilution by adding fluorescent dye and measuring the dye concentrations in the effluent field. These techniques usually involve an averaging period of less than 2 sec and tend to sample the effluent concentration in individual cells. Predicted and measured positions of effluent fields in four cases were compared and found to be in good agreement in the center of the fields. Thus, the entrainment coefficients derived in small-scale laboratory experiments were found to be applicable at a much larger scale of existing ocean outfalls. Also, under low current speed conditions, the contribution of ambient turbulence to initial dilution was small relative to the effect of the buoyancy and momentum of the effluent discharge. (Small-FRC)
W81-05491

OXYGEN TRANSFER PARAMETER ESTIMATION,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. K. Stenstrom, L. C. Brown, and H. J. Hwang.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 379-397, April, 1981. 2 Fig, 17 Tab, 15 Ref.

Descriptors: *Aeration, *Oxygen transfer, *Nonlinear programming, Field tests, Dissolved oxygen, Aerobic conditions, Hydraulic engineering, Wastewater treatment.

Two exponential parameter estimation techniques are demonstrated which use simple nonlinear programming to estimate oxygen transfer rates. These techniques can be programmed on an advanced programmable calculator, which can allow field investigators to perform exponential parameter estimation in the field. The techniques can analyze nonsteady state reaeration data. Either technique can efficiently provide parameter estimates, and they both converge to the same final values. Both techniques eliminate the need to estimate the saturation dissolved oxygen concentration from a handbook or using depth/correction methods. Also, the need to truncate data when the dissolved oxygen concentration approaches saturation is eliminated. The techniques can be modified slightly and used for other nonlinear programming applications in environmental engineering, including estimating biochemical oxygen demand rate coefficients and isotherm coefficients. Underestimating or overestimating the oxygen transfer rate on a proposed aeration system can be avoided by the design engineer using these techniques. (Small-FRC)
W81-05492

PACKED BED BIOFILM REACTORS: DESIGN,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
A. D. Meunier, and K. J. Williamson.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 319-337, April, 1981. 16 Fig, 1 Tab, 15 Ref.

Descriptors: *Packed beds, *Filtration, *Mathematical models, Fermentation, Nitrification, Denitrification, Plug flow, Water treatment, Hydraulic engineering, *Wastewater treatment.

A biofilm model and calculator program for the design of submerged plug-flow biofilm reactors were applied to different biofilm reactors. Estimates of various physical and kinetic parameters were obtained from the literature and used to verify the model. The biofilm reactors were: a submerged rock filter for fermentation, denitrification, or nitrification with preoxygenation; an expanded bed reactor with a glass bed medium for denitrification; and an expanded bed reactor with sand medium for aerobic respiration with preoxygenation, denitrification, or nitrification with preoxygenation. The model gave good predictions of experimental results. In general, the maximum utilization rates were less for biofilm reactors than for suspended growth reactors, and were less for submerged filter reactors than expanded bed reactors. The expanded bed reactor had a higher removal rate than the submerged filter. The electron donor was determined to be the limiting species in plug-flow biofilm reactors for aerobic respiration of sewage, nitrification, and denitrification with methanol when the electron donor and electron acceptor were present in stoichiometric quantities in the influent. (Small-FRC)
W81-05494

PACKED BED BIOFILM REACTORS: SIMPLIFIED MODEL,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
A. D. Meunier, and K. J. Williamson.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 307-317, April, 1981. 3 Fig, 5 Ref.

Descriptors: *Biofilters, *Mathematical models, *Packed beds, Design criteria, Biological treatment, Wastewater treatment.

A mathematical model was developed which can be used to design expanded bed and submerged filter biological reactors. The limiting species of either the electron donor or electron acceptor are determined as well as the flux of electron donor corresponding to concentrations of either the electron donor or electron acceptor. The required design volume is determined from the calculated flux. The model considers two basic processes. First, the diffusion of substrate from the bulk liquid into the biofilm is accounted for. Second, transformation of the substrate by bacteria within the biofilm is considered. The model has been programmed so that calculations can be accomplished on a hand-held calculator. This offers wide-scale availability to designers who formerly had to depend on pilot-plant tests. Many biological waste treatment reactors use treatment by bacterial films on stones, glass beads, sand, plastics, redwood slats, and activated carbon. This design method theoretically includes the important factors affecting wastewater treatment. (Small-FRC)
W81-05495

DISSOLVED AIR FLOTATION: THE INCREASING DEMAND
Water and Waste Treatment, Vol 23, No 3, p 33-35, March, 1980. 2 Fig.

Descriptors: *Flotation, *Water treatment, Water supply, Water quality, Potable water, Raw water, Drinking water, Clarification, Separation techniques, Primary wastewater treatment, Color removal.

Dissolved air flotation has been used as a practical and cost effective means of providing a primary separation stage in the treatment of highly colored raw water. Raw water supplied to the filter station where the dissolved air flotation method was to be employed is cold, soft and peaty, often with a rich brown color ranging from 20 to 500 Hazen. Flocculation with alum precipitates the color in an insoluble form, but the settlement characteristics are poor, and flotation proved effective as a means of separation. The plant is designed for a nominal load of 7700 cubic meters per day, and by removing more than 85% of the alum/color flocculated material it ensures that filter runs greater than 24 hours are now produced by the existing filters. Dewatering of the floated sludge is carried out by filter pressing. When flotation rather than sedimentation is used as the primary clarification process, the filter can be included within the same unit structure, allowing a high throughput per unit. The frequency of backwashing obviously depends on the solids loading. Under normal conditions average periods of between 36 and 72 hours have been typical. Dissolved air flotation has also been used with automatic operation systems controlled by microprocessors. The use of flotation has been seen to double the existing water output. (Baker-FRC)
W81-05499

BIOLOGICAL PROCESS DIFFUSIONAL LIMITATIONS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
C. N. Haas.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 269-273, February, 1981. 2 Tab, 12 Ref.

Descriptors: *Activated sludge process, *Flocculation, *Particle size, *Wastewater treatment, Oxygen, Nutrients, Biological treatment, Diffusion.

An estimate is presented of the critical floc size above which diffusional limitations within the particle are of significance. In particular, the critical sizes for the onset of a diffusional limitation by oxygen and by a carbonaceous substrate were calculated. Weisz's approach was used in the analysis of kinetics of aerobic suspended growth processes such as activated sludge. This technique permits the estimation of the extent to which diffusion limits over-all reaction rates, without explicit assumptions as to reaction order. Calculated values of radii beyond which diffusional limitations appear significant suggest that in many cases, diffusional limitations within activated sludge flocs may be important. Under various circumstances, the critical radius may be different for oxygen than for substrate, and thus there may be anoxic zones with excess nutrient or nutrient poor zones with excess oxygen. (Small-FRC)
W81-05524

EQUALIZATION-NEUTRALIZATION BASIN DESIGN,
HydroQual Inc., Mahwah, NJ.
D. M. Di Toro, J. E. La Padula, and J. P. Watkins.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 251-265, February, 1981. 9 Fig, 2 Tab, 2 Ref.

Descriptors: *Hydrogen ion concentration, *Neutralization, *Equalizing basins, *Wastewater treatment, Basins, Pilot plants, Industrial wastes, Costs.

An analysis of equalization-neutralization basins for pH control was developed which permits the design of equalization-neutralization facilities based on cost optimization. This type of basin reduces the effluent pH variability of a wastewater discharge by mixing high influent pH occurrences with low pH influent or visa versa. The methodology was verified using pilot plant studies on wastewater discharged from a pharmaceutical plant. Continuous recorders were placed in the overflow compartment to monitor the influent pH, in the equalization basin to record the pH of the equalized wastewater, and in the neutralization basin to monitor the final pH of the effluent discharge. Both the pH in the pilot plant equalization-neutralization basin and the quantities of acid and bases required to maintain a given pH range were successfully verified. A sample design is presented based on an optimization of the capital cost of building the basin and the operation and maintenance costs of providing and adding chemicals. (Small-FRC)
W81-05525

FAILURE ANALYSIS OF LARGE SEPTIC TANK SYSTEMS,
Washington Univ., Seattle. Dept. of Environmental Health.
F. B. DeWalle.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 229-240, February, 1981. 5 Fig, 3 Tab, 14 Ref.

Descriptors: *Septic tanks, *Graphical analysis, *Performance evaluation, Soil types, Wastewater treatment, Maintenance, Washington, Mechanical failure.

Systematic failure analysis of on-site wastewater disposal systems with large institutional septic tanks is described. This analysis involves the construction of survival curves for systems, which includes determining how many large systems have been constructed in a given year. Then, the percentage of the initial systems which are still operating each successive year after the initial construction is calculated. If the failure rate is high, the soil type can be judged less suited for on-site disposal. Also, the relationships between failure rate and loading design, degree of maintenance, and height of water table can be used to provide information useful in the design of large systems. Data are presented from a State of Washington survey of large, on-site sewage disposal systems. A failure rate of 73 large systems per year (6.6%) was estimated for the state, which represents a loss of $730,000/year for institutions or commercial owners. (Small-FRC)
W81-05527

DESIGN OF 90-MGD WASTEWATER RECLAMATION PLANT,
Bechtel Inc., San Francisco, CA. Dept. of Environmental Water Projects.
C. B. Cain, J. W. Kluesener, and E. Lazarus.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 29-45, February, 1981. 3 Fig, 2 Tab, 5 Ref.

Descriptors: *Reclaimed water, *Cooling water, *Secondary wastewater, Water treatment, Nuclear powerplants, Arid climates, Trickling filters, Solids contact processes, Control systems, *Wastewater treatment facilities, Design criteria.

The design of a water reclamation plant is discussed which will provide cooling water for a 3810 Mwt nuclear generating station in Arizona. Laboratory studies and a pilot plant were used to select the flow scheme for the plant which will reclaim secondary sewage effluent. A standard trickling filter and solids contact softening technology will be used. Several innovations in the final design are: flow recirculation is now provided around the solids contact clarifiers, sludge recirculation is provided around the thickeners, and automatic flushing is provided to protect sludge lines against clogging problems. Consistent plant operation is possible through the use of a computerized process control system. Redundant mechanical equipment is provided throughout the plant to assure reliability. The plant will be able to handle either low flows or high flows. The power plant cannot afford to shut down because of lack of cooling water, so the reliability of the reclamation plant is emphasized. (Small-FRC)
W81-05530

REJUVENATION OF FAILED SOIL ABSORPTION SYSTEMS,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop, and H. S. Logsdon.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 47-55, February, 1981. 5 Tab, 8 Ref.

Descriptors: *Municipal wastes., *Soil absorption capacity, *Rehabilitation, *Wastewater treatment, Loam, Sand, Percolation rate, Chemical treatment.

The use of hydrogen peroxide to rejuvenate failed domestic soil absorption systems was evaluated. In

tests with four soil types, raw municipal wastewater was applied at a rate of 0.02 gal/column two or three times a day until a crust or clogging zone was built up. Hydrogen peroxide was applied in three doses, and percolation rates were compared with initial percolation rates. Percolate was collected and analyzed for oxidation-reduction potential, nitrate, ammonia, and total Kjeldahl nitrogen concentration. The columns were then redosed to evaluate rejuvenation efficiency. Tests were also performed on soil samples taken from a failed soil absorption system. The use of hydrogen peroxide was effective particularly with sandy loam or loamy sand soils. Sandy soils were successfully rejuvenated with applications of 7.5% and 15% hydrogen peroxide. Loading rates on the order of 0.125 lb H202/sq ft to 0.250 lb H202/sq ft of absorption bed area were found to be adequate. More field experimentation is recommended. (Small-FRC)
W81-05531

VIRUS REMOVAL IN PRIMARY SETTLING OF RAW SEWAGE,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
V. C. Rao, S. B. Lakhe, S. V. Waghmare, and V. Raman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 57-67, February, 1981. 7 Tab, 17 Ref.

Descriptors: *Viruses, *Sedimentation, *Lime, Suspended solids, Pilot plants, Enteroviruses, Developing countries, *Wastewater treatment, Public health.

In order to determine what percentage of viruses is removed by primary sedimentation, quantitative methods for sampling and evaluating sewage and effluent were developed. Three sampling methods were used at an activated sludge treatment plant at Dadar, Bombay, and from a pilot plant. These were: a 24-hr composite sample consisting of two hourly grab samples, a 5-hour pooled hourly dip sample, and a 5-hr pooled hourly half-processed dip sample. A quantitative method developed by Rao et al. was used to concentrate viruses from known volumes of composite samples, and viral plaque-forming units in the sample concentrations were obtained. Enteric viruses in small volumes were recovered from all the samples employed. Except for the monsoon months (June and July), viruses removal ranged from 41 to 83%, average of 63%. The pilot plant study found suspended solids removal was associated with increased virus removal. Primary sedimentation of raw sewage followed by lime coagulation and settling may eliminate viruses to a high degree. This economical method would be useful in developing countries. (Small-FRC)
W81-05532

CALCIUM PHOSPHATE PRECIPITATION IN AQUEOUS CALCITIC LIMESTONE SUSPENSIONS,
State Univ. of New York Coll. at Plattsburgh. Inst. for Man and Environment.
For primary bibliographic entry see Field 2K.
W81-05536

COST-EFFECTIVE COMBINED SEWER OVERFLOW POLLUTION ABATEMENT PLANNING,
Bogert (Clinton) Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 8A.
W81-05545

LAS VEGAS: GROWTH PLUS CLEAN WATER,
Clark County Sanitation District, Las Vegas, NV.
R. Billi, D. Tusak-Gilmour, and J. Wren-Jarvis.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2291-2297, September, 1980.

Descriptors: *Tertiary treatment, *Sewage treatment, *Sludge disposal, *Las Vegas, Nevada, Wastewater treatment, Ultimate disposal, Activated sludge.

The Clark County Sanitation District, serving Las Vegas, Nevada, operates a trickling filter plant with a 40 mgd capacity, sufficient to handle the present sewage load until the advanced waste water treatment plant is completed in 1981. In late 1979, three 3,500 gal sludge injection trucks were purchased to inject sludge into the subsoil, not only alleviating overloading and odor problems, but allowing the existing thermal conditioning facilities to be utilized only as a back-up. All sludge will be treated at the new advanced treatment plant when completed. The new plant will process secondary effluent with lime flocculation, clarification, alum flocculation, pH adjustment, mixed-media filtration, post-aeration, and post-chlorination. Lime conditioned sludge will be dewatered and transported to a sanitary landfill. These facilities are expected to serve the needs of Las Vegas until the year 2000. (Cassar-FRC)
W81-05546

PRETREATMENT OF INDUSTRIAL DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS,
Brown and Caldwell, Seattle, WA.
J. E. Ongerth, and F. B. DeWalle.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2246-2256, August, 1980. 11 Fig, 5 Tab.

Descriptors: *Industrial wastes, *Chemical wastes, *Heavy metals, *Water pollution control, Wastewater treatment, Metals, Aromatic compounds, Pollutants, Pretreatment of wastewater.

Seattle surveyed industrial plants to document the volumes and chemical nature of waste discharges from major industrial dischargers. BOD ranged from 1000 mg per liter to 100,000 mg per liter, and 60-100 dischargers of 1 or more heavy metals were identified. Median concentrations (in micrograms per liter) of metals in mixed waste water including both industrial discharges and municipal waste water were: Zn 400, Cu 215, Pb 120, Cr 105, Ni 65, and Cd 9. Raw waste waters were analyzed for the 114 organic priority pollutants; 36 were detected in 11 samples. Toluene was present in highest concentrations, 250 micrograms per liter, with chlorinated hydrocarbons, benzene and derivatives, phenol and derivatives, phthalates, and polynuclear aromatics also detected. Total organic priority pollutant removal was 48% by primary treatment (adsorption of high molecular weight compounds onto solids) and 61% by secondary treatment (volatile components such as low molecular weight chlorinated hydrocarbons). Pretreatment of industrial wastes would cut organic priority pollutant levels in half, being effective for chlorinated solvents and phenols, but not for phthalates. If the municipal treatment works handles the full pollutant load without pretreatment, sludge will contain more metals and organics, posing a solids disposal problem. (Cassar-FRC)
W81-05547

MT. ST. HELENS' EFFECTS ON WASHINGTON'S TREATMENT PLANTS,
T. Kish.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2310-2313, September, 1980. 2 Fig.

Descriptors: *Volcanoes, *Equipment, *Damages, *Mt St Helens, Washington, Fallout, Ash, Wastewater treatment, Disasters, Trickling filters, Pumps, Fouling, Biomass.

The May 1980 eruption of Mt. St. Helens caused damage to wastewater treatment plants throughout the State of Washington. Ash deposits in plant processes, line plugging, pump and other equipment failures, hydraulic overloading, biomass washout, and digester upsets were common. The Moses Lake (1.1 mgd) trickling filter plant was totally out of service until late July. Heavily chlorinated raw wastewater was bypassed to spare the machinery and discharged into the lake, causing fishkills and a ban on swimming and recreation. Ash from the streets compacted in storm sewers and required jet-flushing. The biomass on the trickling filter was totally destroyed. The City of Ritzville bypassed ash-laden wastewater for several days, saving the clarifier and digester from being filled. Nevertheless, metal parts were worn down, and motors burned out. Spokane also shunted wastewater, but pump failures were common. Nanches lost much of the biomass, and ash collected in clarifiers. The EPA commended treatment plant operators for acting quickly to save millions of dollars in damage to facilities. (Cassar-FRC)
W81-05548

ANAEROBIC PHENOL BIOKINETICS,
Pittsburgh Univ., PA.
R. D. Neufeld, J. D. Mack, and J. P. Strakey.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2367-2377, September, 1980. 10 Fig, 2 Tab, 28 Ref.

Descriptors: *Phenols, *Microbial degradation, *Anaerobic digestion, Bacteria, Aromatic compounds, Chemical wastes, Industrial wastes, Organic compounds, Wastewater treatment, Degradation(Decomposition), Anaerobic bacteria, Biodegradation, Kinetics, Coal gasification.

Anaerobic bacterial degradation of high level phenolic waste waters was investigated in the laboratory. This process proved feasible with a maximum specific degradation rate of 0.08 mg phenol per mg volatile suspended solids per day (0.5-0.8% of the aerobic rate). At phenol levels above 686 mg per liter the reaction was progressively inhibited. A biological solids retention time of at least 40 days is suggested for stable anaerobic phenol digestion. Methane was not generated in these experiments. End products of the degradation were volatile straight chain acids (propionic through heptanoic). The anaerobic process is an alternative to activated carbon, chemical oxidation, extraction, coagulation and aerobic biological methods for effluents from coal gasification plants. (Cassar-FRC)
W81-05550

SEPTIC SYSTEM LONGEVITY INCREASED BY IMPROVED DESIGN,
Connecticut Agricultural Experiment Station, New Haven.
D. E. Hill, and C. R. Frink.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2199-2203, August, 1980. 1 Fig, 3 Tab, 6 Ref.

Descriptors: *Septic systems, *Design standards, *Percolation, Longevity, *Septic tanks, Regulations, Domestic wastes, Sewage treatment, Soil disposal fields, Waste treatment, Soil types, Wastewater treatment, Glastonbury, Connecticut.

Improvements in septic system longevity and reduction in premature failures in Glastonbury, Connecticut, were the result of major design changes in 1961, which increased the required size of systems, and 1972 requirements for spring percolation testing and deep pit observation. The computed half life of systems in 1973 was 27 years, in 1978, 36 years. Present half lives (in years) of septic systems by soil type are as follows: stratified sand and gravel, 32.9; loose glacial till, 26.8; compact glacial till, 53.2; shallow to bedrock, 37.7; and poorly drained, 59.7. Half lives in two categories were greatly improved since the new regulations became operative. Compact glacial till systems added 15 years, and poorly drained systems, 35 years. The premature failure rate decreased by 0.6% in the total population since 1973. The study will continue to monitor the responses of septic systems to changes in regulations designed to improve their life span. (Cassar-FRC)
W81-05551

EXPERIENCE WITH BELT FILTER PRESSES IN THE PULP AND PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Gainesville, FL.
R. Miner.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2389-2395, September, 1980. 4 Fig, 1 Tab, 2 Ref.

Descriptors: *Pulp and paper industry, *Sludge treatment, *Polyelectrolytes, *Filters, *Belt filters,

Operation and maintenance, Wastewater treatment, Industrial wastes.

An overview of belt filter press use in the pulp and paper industry is presented. These presses have been installed during the past five years in about 24 mills for handling difficult-to-dewater sludges and solids. Performance levels and costs vary among the mills, primarily because of differing sludge characteristics and amounts of conditioners used. Costs of conditioning to improve dewatering characteristics vary from $0 to $5 per ton for primary sludges and from $30 to $50 per ton for biological sludges. Data collected from plant surveys show that equipment can process 120-370 liters per min primary sludge per meter belt width and 62-125 liters per min biological sludge per meter belt width. Cake consistencies vary from 20 to 50% solids for primary sludge and from 10 to 20% solids for biological sludge. Short belt life continues to be a common operating problem because of puncturing, abrasion, and seam failure. Using heavy duty belts, comminuters, and debris removal devices can extend belt life considerably. During normal operation only 1-2 hours of operator time is required per shift. (Cassar-FRC)
W81-05553

LAS VEGAS BETS ON A SURE WINNER,
J. B. Gilbert, G. L. Culp, and J. E. Salo.
Water and Wastes Engineering, Vol 17, No 9, p 16-21, September, 1980. 5 Fig, 6 Tab.

Descriptors: *Costs, *Tertiary treatment, *Alternative planning, *Las Vegas, Nevada, Environmental effects, Planning, Wastewater treatment, Capital costs, Operating costs, Lime.

The City of Las Vegas, Nevada, was ordered by the court on March 15, 1979, to improve the quality of the water discharged from its municipal treatment plant into the Las Vegas Wash, a wetlands tributary of Lake Mead. As part of a comprehensive study of water quality and treatment facilities, six alternatives were evaluated. The most economical, functional, and environmentally desirable alternative integrated the existing treatment plants with a planned advanced treatment plant. The City of Las Vegas plant would process 37.5 mgd of wastewater by screening, grit removal, primary sedimentation, trickling filter, secondary sedimentation, and chlorination, followed by effluent discharge into Las Vegas Wash and sale as irrigation water. The Advanced Treatment Plant would screen 21.5 mgd, receive 40.0 mgd secondary effluent from the Clark County Sanitation District, and process the combined influent by aeration in surge ponds, chemical treatment (lime, flocculation, clarification, acid addition, alum flocculation, and filtration), chlorination and discharge to the Las Vegas Wash. Processed, dewatered sludge would be put in landfills or used as a soil amendment. Operating and maintenance costs for this alternative are $5.47 million for high lime and $5.0 million for low lime. Other treatment alternatives range from $7.4 million to $4.8 million. At present, the low lime mode will be used, but alum may be easily substituted. (Cassar-FRC)
W81-05567

ACTIVATED CARBON--THE DILEMMA FACING ITS USE,
S. Miller.
Environmental Science and Technology, Vol 15, No 5, p 502, May, 1981.

Descriptors: *Activated carbon, *Adsorbents, Organic compounds, Industrial wastes, *Wastewater treatment, Evaluation.

Activated carbon treatment of wastewater has not reached the widespread use expected. Although it effectively removes the majority of the 114 organic priority pollutants, each situation needs specific design parameters. Adsorber loadings, contact times, staging effects, carbon exchange rates, and regeneration requirements cannot be generalized or extrapolated to other systems. In addition, energy requirements for regeneration are high, properties of the commercially available carbons vary widely, and the EPA considers it an innovative technology. Of 32 municipal plants built to use activated carbon, only two are using it at present. Areas where further study is needed are hierarchical adsorbate displacement, in situ regeneration, continuous process design, more efficient and lower cost regeneration technology, adsorbate recovery and reuse, and prediction of applications in wastewater treatment. (Cassar-FRC)
W81-05568

OPERATOR TRAINING; PRINCIPLES AND CASE STUDY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard, and K. D. Kerri.
Journal of the Water Pollution Control Federation, Vol 52, No 2, p 236-240, February, 1980. 2 Fig, 2 Tab, 8 Ref.

Descriptors: *Training, *Operations, *Wastewater treatment, Personnel, Water treatment facilities.

Well-trained and highly motivated treatment plant operators are the key to successful waste water treatment. Good training programs begin with a thorough study of the needs and the most cost-effective method of delivering this information. Specific objectives must be outlined and courses designed to accomplish these objectives. Several training methods are available, usually used in combination: on-the-job training, discussion, classroom, self-study, and supplementary training. A graph illustrates the effluent quality (BOD and suspended solids) produced by trained and non-trained operators. Effluent from plants with trained operators did not exceed 15 mg per liter suspended solids or 10 mg per liter BOD; non-trained operators were responsible for many periods of poor effluent quality during a year's comparison, up to 160 mg per liter suspended solids and 60 mg per liter BOD. (Cassar-FRC)
W81-05570

CESSPOOL SLUDGE UNDERGOES TREATABILITY STUDY,
Applied Scientific Research Corp. of Thailand, Bangkok.
S. Ratasuk, and C. Kinsukonth.
Water and Sewage Works, Vol 127, No 2, p 48-49, 57, February, 1980. 2 Fig, 3 Tab.

Descriptors: *Sludge conditioning, *Cesspools, Wastewater disposal, Sludge lagoons, Sludge disposal, Sludge, *Wastewater treatment, *Bangkok, Thailand.

The cesspool system of Bangkok periodically fills with sludge due to a high water table, very poor permeability, and high population density. Sludge is then pumped out and disposed of in a lagoon. The average retention (anaerobic digestion) time for this sludge is about one year. About 600 cubic meters of sludge is collected daily from these systems, serving 4.2 million people. Samples of cesspool sludge and supernatant were analyzed and found to differ significantly in all characteristics except pH. Studies indicate that BOD removal would not be a major problem in the treatment of cesspool sludge compared to solids removal and dewatering. The initial treatment should be chemical coagulation to improve the sludge filterability or conditioning and to clarify the supernatant. Simple settling of cesspool sludge yielded a supernatant which was high in suspended solids, ammonia nitrogen and BOD. After treatment with aeration for two days about 82.6% of the COD was removed; 91.7% of the BOD and 80% of the suspended solids were also removed. Experimental results indicated that treatment by the activated sludge process is not appropriate for the chemical coagulated supernatant because of its low efficiency. A simple process such as oxidation ponds or open-sand filters may be considered for polishing this low BOD waste. (Baker-FRC)
W81-05571

OPERATOR TRAINING AND PLANT START-UP FOR A REGIONAL WATER RECLAMATION PROJECT,
CH2M Hill, Reston, VA.
G. A. Gunn, G. W. Rehberger, D. W. Rippon, and M. H. Robbins, Jr.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2351-2366, September, 1980. 6 Fig, 7 Tab.

Descriptors: *Training, *Operations, *Personnel management, *Upper Occoquan Sewage Authority, Wastewater treatment, Water use, *Wastewater renovation, Virginia.

Planned and actual programs for training the operating personnel and for start-up of the Upper Occoquan Sewage Authority, Virginia, regional advanced waste water reclamation plant are detailed. Original plans included construction starting Jan. 1977; recruiting and hiring staff starting with the operations director, Apr.-Nov. 1977; operator training starting with the key staff, Sept.-Dec. 1977; and plant start-up Feb., 1978. A detailed table prepared for key staff training listed the subjects and number of hours for each operation in the treatment system, totalling 450 hours of class and field instruction. A similar table listed the general staff training program, totalling 630 hours. Actual implementation of the schedule differed because construction did not proceed on schedule. Since many of the key staff had prior experience, their training period was shortened from 15 to 10 weeks. The general staff training (3-5 weeks) was planned and carried out by key personnel. The plant start-up was delayed several months, causing problems in using the plant for field training. Although the plant had to begin operations before all auxiliary facilities were finished, effluent quality was and has remained very high. (Cassar-FRC)
W81-05572

INCREASED OXYGEN TRANSFER EFFICIENCY WITH COARSE BUBBLE DIFFUSERS,
Rexnord, Inc., Milwaukee, WI.
T. C. Rooney, and G. L. Huibregtse.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2315-2326, September, 1980. 10 Fig, 6 Tab, 9 Ref.

Descriptors: *Aeration, *Oxygenation, *Mixing, *Diffusion, Dissolved oxygen, Turbulence, Bubbles, Wastewater treatment, Design criteria.

An aeration tank 30 ft x 80 ft with water depths 13 to 21 ft was used to test the oxygen transfer efficiency of two coarse bubble diffusers with varying header patterns and diffuser density. Two basic mixing patterns were observed: a wall reflected (axial) pattern characterized by low oxygen transfer and higher mixing turbulence, and a multi-source interference (cross) pattern characterized by higher oxygen transfer and localized mixing cells with lower turbulence. If the mixing pattern is constant, there is a linear response between oxygen transfer rate per basin volume and air flow per basin volume at each water depth. Using an optimum header placement geometry and mixing pattern, oxygen transfer efficiency can be increased up to 75%. Neither number of diffusers nor type of coarse bubble diffuser affected the oxygen transfer rate. Narrow band and wide band diffusers performed equally well. In designing treatment systems, the engineer can transfer data from one size test basin to another as long as the same mixing pattern is produced in both. In addition, it must not be assumed that adequate mixing and oxygen transfer are synonymous. (Cassar-FRC)
W81-05573

RELATIONSHIP OF DESIGN CAPACITY TO EFFLUENT QUALITY,
Northampton County Area Community Coll., Bethlehem, PA.
For primary bibliographic entry see Field 6B.
W81-05575

AIRBORNE BACTERIAL DENSITIES AT AN ACTIVATED SLUDGE TREATMENT PLANT,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 5B.
W81-05576

MAKING MAINTENANCE WORK RECORDS WORK,
Metropolitan Denver Sewage Disposal District No. 1, Denver, CO.
A. M. Holst, and J. Puntenney.
Water and Sewage Works, Vol 127, No 1, p 46, 48, January, 1980.

Descriptors: *Maintenance, *Logging(Recording), *Accounting, Data processing, Information systems, Performance evaluation, *Wastewater facilities, Operating policies, *Denver, Colorado.

The successful use of maintenance records by Metropolitan Denver Sewage Disposal District No 1 is described. The supervisor plans his daily work based on the priority and the description of the problem indicated on the maintenance request. If the request is a new one, the supervisor estimates the completion date and assigns the project to a worker. When the work is to begin, the supervisor separates his copy and gives the remaining two copies to the worker. Time spent on the job and parts obtained from the warehouse are recorded on the worker's forms. Purchase requisitions and parts requisitions are matched against the maintenance record form. Costs are summarized on the completed form, and it is transmitted to data processing for input into the computer. The computer calculates the labor cost directly. Weekly reports are generated which summarize the status of all maintenance reports. Preventive maintenance is scheduled manually. (Small-FRC)
W81-05581

CONDUCT AND USES OF JAR TESTS,
Water and Air Research, Inc., Gainesville, FL.
H. E. Hudson, Jr., and E. G. Wagner.
Journal of the American Water Works Association, Vol 73, No 4, p 218-223, April, 1981. 12 Fig, 9 Ref.

Descriptors: *Measurement techniques, *Planning, *Water treatment, Flocculation, Chemical coagulants, Water treatment facilities, Benefits, Turbidity, Water quality, Design Criteria.

Jar test procedures can be used to produce data which are directly applicable to water treatment plant design, modification, and operation quickly and economically if the procedures simulate treatment plant conditions. Square jars which are fabricated by cementing together sheets of acrylic plastic are used in the current standard procedures. A sampling tap inserted through the wall of the container permits control over the depth at which samples are taken. Samples are withdrawn through the tap at intervals of 1, 2, 5, and 10 minutes following termination of the flocculation period, corresponding to settling velocities of 10, 5, 2 and 1 centimeter per minute, respectively. The bench-scale test results following rapid mixing and flocculation are then plotted on a graph to develop a settling velocity distribution curve. The jar tests can be used for control of coagulant dosage, determination of the strength of floc, prediction of filtered water quality, determination of optimum coagulant pH and mixing intensity, evaluation of rapid mix duration and intensity, evaluation of the sequence of coagulant and coagulant aid dosages, and prediction of design criteria for in-plant settling, as well as a variety of other purposes. Since the residence time in the plant settling basins is always greater than in the jars, data from well-designed plants are usually better than those predicted from jar testing. (Carroll-FRC)
W81-05608

COMBINED SEWER OVERFLOW CONTROL--MARGINAL BENEFIT VERSUS COST ANALYSIS,
CH2M/Hill, Bellevue, WA.
For primary bibliographic entry see Field 6B.
W81-05619

RIVER QUALITY MODEL FOR URBAN STORMWATER IMPACTS,
Duke Univ., Durham, NC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W81-05627

REVERSE OSMOSIS SEPARATION OF RADIUM FROM DILUTE AQUEOUS SOLUTIONS,
Barringer Magenta Ltd., Rexdale (Ontario).
K. S. Subramanian, and V. S. Sastri.
Separation Science and Technology, Vol 15, No 2, p 145-152, 1980. 5 Tab, 9 Ref.

Descriptors: *Reverse osmosis, *Radioactive wastes, Membrane processes, Water pollution control, *Industrial wastes, Radium-226, Radium, Wastewater treatment.

As part of a program of low-pressure reverse osmosis and its application to the treatment of waste effluents, a detailed study of the reverse osmosis treatment of radium-bearing effluents under a variety of conditions was undertaken. Porous cellulose acetate membranes were characterized in terms of the pure water permeability constant, solute transport parameter, and mass transfer coefficient with aqueous sodium chloride solution as the reference system. Reverse osmosis separation behavior of radium-226 as nitrate, chloride and sulfate salts was studied. The reverse osmosis method of removing radium-226 from aqueous solutions was compared with other methods, and it has been shown to be one of the best methods for alleviating radium contamination problems. (Baker-FRC)
W81-05629

CONTROLLING FINISHING INDUSTRY DISCHARGES,
C. A. Smith.
Effluent and Water Treatment Journal, Vol 20, No 3, p 105-109, March, 1980. 2 Tab.

Descriptors: *Rinse water, *Wastewater treatment, Industrial wastes, Heavy metals, Metals, Chromium, Cyanide, Nickel, Copper, Zinc, Tin, Waste recovery, Chemical recovery, Water reuse.

Discharges from the metal finishing industry are high in nickel, copper, zinc, hexavalent chromium, tin, and cyanide. The basic treatment process involves separate handling of acid-Ni-Cu effluent and alkaline-cyanide-Zn-Cd-Cu effluent. First, the cyanide is decomposed and the hexavalent Cr reduced. The two streams are combined, metals precipitated as hydroxides, and sludge removed. The resulting effluent may be further treated. The static rinse or drag-out tank is a simple method of reducing water contamination. Neutralizing dips reduce the Cr carry-over into the rinse by precipitation of Cr(OH)3. Reducing the volume of rinse water provides a smaller but more concentrated effluent. Counterflow rinses can reduce water requirements as much as 70-80%. Spray rinsing is more efficient than immersion rinsing. Multiple use of water such as utilizing uncontaminated cooling water for rinsing makes maximum use of water. Sequential rinses must be designed so that the second rinse has no harmful effects on the electrodeposit. Treated effluent can be used at noncritical rinse stages. Recovery of metals and resulting improvement in water quality can be economical for many plants. Evaporative recovery is widely used for solution concentration. Effluent treatment and disposal techniques are described. These involve oxidation, reduction, neutralization, precipitation, flocculation, sedimentation, and filtration. (Cassar-FRC)
W81-05636

A RE-ASSESSMENT OF EXPERIMENTAL WORK ON BIOLOGICAL FILTRATION,
T. Stones.
Effluent and Water Treatment Journal, Vol 20, No 1, p 10-15, January, 1980. 15 Tab, 16 Ref.

Descriptors: *Filtration, *Biological filters, *Oxygen demand, Nitrogen compounds, Wastewater treatment, Chemical oxygen demand, Biological oxygen demand, Clogging.

Two methods of controlling clogging of biological filters, recirculation and alternating double filtration, reduce the concentration of nutrients in the filter feed. These were compared with orthodox single filtration in laboratory studies. There was no great difference among the three processes in percent reduction of total carbonaceous demand. The principal differences were in reduction of nitrogenous oxygen demand. Percentages of total nitrogen remaining in crude liquor (dosages 100, 200, and 275 gallons per cu yd per day) were 71.4-77.2 for single filtration, 57.3-63.0 for double filtration, and 48.8-56.4 for recirculation. The overall differences in performance were so slight that pilot plant studies should be conducted before making full-scale changes. (Cassar-FRC)
W81-05638

RATIONALISATION OF DIMENSIONS AND SHAPES FOR SEWAGE TREATMENT WORKS CONSTRUCTION,
Hawksley (Watson), High Wycombe (England).
J. M. Sidwick.
Effluent and Water Treatment Journal, Vol 20, No 6, p 285-288, 291, June, 1980.

Descriptors: *Wastewater facilities, *Design criteria, *Tanks, Publications, Construction, Settling tanks, Aeration, Sludge thickening, Anaerobic digestion, Biological filters, Sedimentation, Shape.

The Construction Industry Research and Information Association issued Report No. 82 on the title subject in September, 1979, after several years' work by a committee representing water authorities, civil engineering contractors, machinery manufacturers, and consultants. The study was initiated under the idea that development of a range of preferred shapes and sizes of units will avoid wasted effort and help ensure that functional and safety requirements are met economically, but without limiting the designer's freedom of choice. The report includes dimensions and design criteria for circular sedimentation tanks (primary tanks, storm water tanks, activated sludge tanks, and humus tanks); rectangular sedimentation tanks (primary sedimentation and storm tanks); biological filters (circular-shaped with conventional media); aeration tanks (surface aeration and diffused air activated sludge units); heated anaerobic digestion tanks; and sludge conditioning tanks. (Cassar-FRC)
W81-05639

SLUDGE TREATMENT/HANDLING, PRELIMINARY TREATMENT, AND INSTRUMENTATION TOP O AND M PROBLEM LIST,
S. J. Hadeed.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 412-420, April, 1981. 10 Tab.

Descriptors: *Wastewater treatment, *Maintenance, Maintenance costs, Pumps, Sludge, Instrumentation, Training, Management, Decision making, Operating costs.

Survey forms were distributed to administrators of wastewater treatment systems. These forms addressed several major problems in the operation and maintenance (O and M) areas of wastewater treatment facilities. Questionnaires were returned from 460 individuals covering 45 states and were analyzed based on parameters such as flow, population served, staffing, operations budget, certification, training programs, incidence of major operations and management problems, major unit process and equipment sources of failure or maintenance, and federal funding. The response demonstrated that O and M problems have resulted in the bypass of one or more processes or whole plant operations for 194 systems, which is 42.2% of the responding systems. In all cases that required technical assistance to solve the problems, 48.9% of the total solutions were permanent, while 74.7% of the solutions could be either permanent or temporary. Training programs were available more frequently as system size increased. Unit processes cited as major sources of failure or maintenance problems by rank include sludge treatment/handling, preliminary treatment, sludge disposal, and biological treatment. Major equipment failures concerned pumps/feeding devices, sludge handling equipment, instrumentation, and preliminary treatment devices. Permanent solutions were more often found for smaller and less complex systems. (Baker-FRC)
W81-05640

ELECTROPLATING EFFLUENT CONTROL - PART 1,
C. A. Smith.
Water Services, Vol 84, No 1007, p 14-16, January, 1980. 2 Tab.

Descriptors: *Electroplating, *Wash water, *Water conservation, Water use, Water reuse, Industrial water, Water treatment.

The control of discharges from electroplating plants and the use of rinses are discussed. A reduction in water flow can result in a reduction in the cost and size of the effluent plant required. Water use can be reduced by reducing the contamination carried into the water rinses through a drip shield or use of catchment trays or pits. Also, a static rinse or drag-out tank can be placed between the process tank and the first running swill. Rinse water usage can be reduced through simple conservation measures such as turning off water when tanks and rinses are not in use and using only the required flow. Improving rinsing efficiency enables the contaminants to be removed effectively and may also reduce water use. The use of two or more water rinses in sequence with the water flowing in a counter-direction to the work movement enables water requirements to be reduced by as much as 70-80%. Spray rinsing can also reduce water usage, as can re-use of water or treated effluent. A deionization unit may purify effluent by removing soluble chemicals. (Small-FRC)
W81-05647

ELECTROPLATING EFFLUENT CONTROL - PART 2,
C. A. Smith.
Water Services, Vol 84, No 1008, p 92-94, February, 1980. 2 Tab.

Descriptors: *Electroplating, *Effluents, Industrial wastes, Metal-finishing wastes, Evaporation, Filtration, *Wastewater treatment, Water treatment facilities.

Evaporation recovery is the most widely used technique for solution concentration, and it can achieve recovery of 80% of the maintenance chemical input to a plant. There are four types of evaporators available commercially: climbing film, flash, submerged tube, and forced draught. Details of the climbing film and flash techniques are given. It is still necessary, however, to provide some form of effluent treatment before it is suitable for discharge to the sewer. Equipment for treating effluents takes the form of batch treatment and continuous flow treatment plants. If effluents are required with a lower suspended solids content than can be obtained by normal settement, then it is necessary to pass the overflow from the clarifier through a filter. The sand filter is perhaps the most widely used for filter type. An integrated treatment system is one in which the tank which would follow each contaminating process tank and normally be used as a water swill is converted to a chemical rinse. Such systems result in a significant reduction in mains water usage and in the volume of effluent discharge, and the resultant effluents are of high quality. Treatment of metal finishing effluent basically comprises a train of comparatively well known chemical treatment processes, but the processes of oxidation, reduction, neutralization, precipitation, flocculation, sedimentation and filtration must be carried out under strictly controlled conditions if consent limits are to be constantly met. (Baker-FRC)
W81-05648

DISSOLVED AIR FLOTATION AND HYDROCYCLONES FOR WASTEWATER TREATMENT AND BY-PRODUCT RECOVERY IN THE FOOD PROCESS INDUSTRIES,
K. J. Ilett.
Water Services, Vol 84, No 1007, p 26-28, January, 1980.

Descriptors: *Food processing industry, *Flotation, *Centrifugation, Food-processing wastes, *Wastewater treatment, Sand, Oil, Grease, By-products.

Some of the applications of dissolved air flotation and hydrocyclone systems for the treatment of wastewater in the food processing industry are illustrated. Both techniques operate on a principle of separation due to the density difference between the solid material being removed and the liquid in which it is suspended. Hydrocyclones work on the principle of centrifugal sedimentation, while dissolved air flotation is based on Henry's law. Hydrocyclones are particularly good for removing dense materials, and applications include the removal of grit and sand from water after the washing of vegetables. This technique can recover valuable by-products such as grain solids from spent wash produced by the distilling industry and starch from the processing of potatoes. Dissolved air flotation is applied to recover oils and fats in edible oil industry wastes. A removal efficiency for fats from slaughterhouse wastes of 80% is possible using dissolved air flotation alone. Light organic matter such as potato peels can also be removed using dissolved air flotation. Recovery of a saleable by-product may, in many cases, pay for the cost of wastewater processing. (Small-FRC)
W81-05664

A NEW DEVELOPMENT IN SLUDGE BLANKET CLARIFIERS,
Ebara-Infilco Co. Ltd., Tokyo (Japan).
T. Ide, and K. Kataoka.
Water Services, Vol 84, No 1012, p 360, 365, June, 1980. 2 Fig, 2 Tab, 6 Ref.

Descriptors: *Sludge conditioning, *Flocculation, Clarifiers, Pelletization, Primary wastewater treatment, Tertiary wastewater treatment, *Wastewater treatment, Suspended solids, Polymers, Alum, Lime.

Pelleting flocculation has been applied to sludge blanket clarifiers. This process involves three possible mechanisms of flocculation: perikinetic and orthkinetic flocculation and mechanic syneresis. In the new clarifier, the blanket zone is stirred slowly with rotating blades to promote contact and subsequent pelletization of the flocs. Individual flocs grow by layering and show an onion-like structure. Alum or slaked lime is added before the organic polymer (in this case nonionic polyacrylamide). The interval between addition of the two materials is critical to ensure that pellets are formed in the blanket and not in the conduit. The blanket zone is stable, with a very high solids concentration. It looks more like a fixed bed than a fluidized bed. In a field test, sewage primary effluent was treated with the alum-polymer process and the lime polymer process. Pelleted flocs formed in the sewage suspension were less compact and the solids concentration in the blanket zone was one order lower than in a kaolinite suspension. However, the blanket zone surface was very stable, and suspended solids were barely detectable in the effluent. (Cassar-FRC)
W81-05669

AN INNOVATION IN WATERWORKS SLUDGE TREATMENT,
Water Research Centre, Stevenage (England).
J. H. Warden.
Water Services, Vol 84, No 1012, p 366, 371, June, 1980. 1 Fig.

Descriptors: *Water treatment facilities, *Sludge thickening, Sludge dewatering, Control systems, Wastewater treatment, Costs, *Sludge treatment.

Cost-effective performance and efficiency are features in a new waterworks sludge treatment plant built by the Anglian Water Authority and the Water Research Centre. As part of the Foxcote Treatment Works, the sludge treatment plant receives sediment sludge in a 23 cu meter balancing tank, where polyelectrolyte solution is dosed at 3.8 mg per liter. The continuous thickener discharges thickened sludge from the floor of the tank. Clarified water overflows at a rate of 1.6 meters per hour at a turbidity of 5 NTU. A photoelectric probe controls the sludge pump, which maintains a constant level of sludge, allowing maximum sludge retention time and a water residence time of 7 or 8 min. The control system makes the plant almost fully automatic. (Cassar-FRC)
W81-05670

EFFLUENT TREATMENT IN A DANISH ORGANIC PIGMENT PLANT.
Water Services, Vol 84, No 1009, p 153-154. March, 1980. 1 Fig, 1 Tab.

Descriptors: *Industrial wastewater, *Chemical wastewater, *Pigments, *Wastewater treatment, Copper, Organic compounds, Phenols.

The new multi-stage waste treatment for the Kemisk Vaerk Koge A/S (KVK), Copenhagen, Denmark, is divided into several steps. First, a buffer lagoon allows mixing and storage. Then chemicals, particularly phenol, are destroyed by reaction with sodium hypochlorite. Electrolysis removes 70% of the copper in the main cell and 29% in a stripper cell. The recovered copper is recycled to the pigment production plant. The waste liquid is neutralized with calcium hydroxide. Organic wastes are biologically decomposed on rotating discs. Effluent is pure enough for guppies to live and breed in it. The secondary clarifier effluent is pumped to a bay. Sludge from the clarifier is dewatered and dried. The lime-slaking process supplies the neutralization plant with 5 tons per day of calcium hydroxide. The wastewater treatment facilities include a control panel, alarm system, and control laboratory. (Cassar-FRC)
W81-05675

OXYGEN: SHAPING UP TO THE FUTURE.
Water Services, Vol 84, No 1010, p 232-233, April, 1980.

Descriptors: *Oxygenation, *Aeration, Wastewater facilities, *Wastewater treatment, Costs.

Proponents of the use of pure oxygen in sewage treatment and aeration processes cite the smaller energy costs (30% cheaper), smaller capital costs, and greater efficiency compared with air processes. The U.S. uses 3,000 tons per day of oxygen in sewage treatment. In the United Kingdom oxygen is used in a supplementary role to handle overloads, odor problems, and septicity. The excellent results of the Holdenhust open-topped sewage works are described. Financing problems are a key to the spread of oxygen use at present. (Cassar-FRC)
W81-05676

SCALE-MODELLING IN SURFACE AERATION SYSTEM DEVELOPMENT,
T. J. Casey.
Water Services, Vol 84, No 1008, p 107-108, February, 1980. 2 Fig, 7 Ref.

Descriptors: *Model studies, *Aeration, Oxidation, Wastewater treatment, Surface waters.

This paper briefly reviews the current state of knowledge on the scaling of surface aeration systems. Scale-modelling has been a long-established procedure for use in engineering design/development techniques. It has been successfully employed in a variety of areas, including structures, process systems and open channel hydraulics. It is particularly appropriate to circumstances where, due to the complexity of system behavior, adequate mathematical modelling procedures are not available. It is potentially valuable in aeration system development. The surface aeration device and the tank in which it operates together form an aeration system with unique oxygen transfer and mixing characteristics. Although these characteristics can be readily measured, their prediction from fundamental analysis is not feasible due to the complexity of the system. The degree of convergence in the example cited in the paper for various types of surface aeration systems shows that scale-up factors for geometrically similar systems can be reliably determined, thus making model study a valuable technique in surface aeration system development. A characteristic relationship between the Newton and Froude numbers for surface aeration systems has been established, enabling the power input in

scale-up to be predicted sufficiently accurately for development purposes. A close correlation was also demonstrated between power input and oxygenation capacity, which enables the latter to be scaled on the basis of power input scaling. (Baker-FRC)
W81-05679

A GLITTERING FUTURE FORESEEN FOR THE CANADIAN MINING INDUSTRY,
T. Bhaga.
Water and Pollution Control, Vol 118, No 5, p 11-12, May, 1980.

Descriptors: *Mine wastes, *Acid mine drainage, *Waste management, Wastewater management, Reclaimed water, Industrial wastes, Industrial wastewater, Canada, Heavy metals, Environmental control, Land reclamation, Water quality control.

A multimillion dollar programs of developing new mines and expanding and reopening old mines in Canada requires an ambitious approach to water supply and treatment in remote mining communities. Mining operations in Canada use over a billion gallons of water daily. The Canadian mining industry is making significant progress in water quality control through increased recycling of process waters and research into the difficult problems of seepage waters, sludge separation, and removal of dissolved impurities. Removal of heavy metals from mine and mill wastewaters is a major problem area. Techniques available for treating wastes with heavy metals include precipitation, cementation, ion exchange, charged membrane ultrafiltration, ozonation, solvent extraction, and electrodialysis. When removal of heavy metals from sludges is not cost-effective, the waste sludges must be disposed of at environmentally safe sites. Case histories of the Brunswick Mining and Smelting Corporation, Limited's mine-mill wastewater treatment system; the Hudson Bay Mining and Smelting Company, Limited's waste management experiences at the mine in Flin Flon, Manitoba; and Cominco's Kimberley, British Columbia facilities are used to illustrate approaches taken by Canadian mining companies to pollution control problems prevalent at mining operations. (Carroll-FRC)
W81-05680

ADVANCED EFFLUENT TREATMENT AS PART OF OPTIMIZED SYSTEMS,
Sulzer Bros. Ltd., Winterthur (Switzerland).
B. Morgeli.
Water Services, Vol 84, No 1008, p 110-111, February, 1980. 1 Fig.

Descriptors: *Advanced wastewater treatment, *Filters, Packed beds, *Wastewater treatment, Secondary wastewater treatment, Tertiary wastewater treatment, Suspended solids, Phosphates, Nitrogen compounds, Percolating filters.

Advanced effluent treatment eliminates substances which are still present in the wastewater after mechanical and biological treatment and which are objectionable in the receiving stream. Attention is usually focused on suspended solids, phosphates and nitrogen compounds. Attempts are being made to improve the discharge parameters by integrating a chemical process in the existing purification stages, such as prior or simultaneous precipitation. The use of percolation filtering or deep-bed filtration applied after the biological treatment appears to be a promising approach. It enables the chemical process to be divided so that the very efficient filtration process takes over part of the job. Less chemical addition is then required. This filtration also removes any suspended matter still remaining after secondary sedimentation. The deep-bed filter amounts technically to a fixed-bed reactor, in which the suspensions or colloidal particles are removed from a fluid-solid mixture as this percolates through a three-dimensional medium. The design concept employed usually depends on what has been accomplished in the earlier treatment stages. Possible solutions are concrete and steel pressure filters forming closed or open systems. An essential feature is the nozzle floor with one or more layers of filter medium above it. (Baker-FRC)
W81-05681

AIRLESS DIGESTION AIRED,
New Jersey Inst. of Tech., Newark. Dept. of Civil and Environmental Engineering.
E. C. Price, and P. N. Cheremisinoff.
Water and Sewage Works, Vol 127, No 4, p 66, 68, April, 1980. 1 Tab, 12 Ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, Anaerobic conditions, Fuel, Methane, Microbial degradation, Moisture, Acidity, Temperature, Digestion, Biodegradation, Biological treatment, *Recycling.

Anaerobic digestion of sludge produces methane or ethanol, which, with decreasing sources of fuel and increasing fuel costs, begins to offer an incentive for this type of digestion. Microbial anaerobic decomposition of organic material produces a biogas consisting of methane (65-70%), carbon dioxide (25-30%), and small amounts of hydrogen, nitrogen, and hydrogen sulfide. In the temperature range of 5 to 50C, the rate of decomposition increases with increasing temperature. Optimum pH ranges for methane producing bacteria have been reported as 6.9-7.2 and 6.6-7.6. It is necessary to add buffering chemicals to maintain nearly neutral pH conditions, such as calcium carbonate. Varying the moisture content from 36 to 99% increased gas production by 670%. Decreasing the size of the solid waste particles results in a proportional increase in the rate of gas production. The nutrients and cations present are also significant factors. (Baker-FRC)
W81-05683

MAINTAINING THE SENSITIVE ENVIRONMENTAL BALANCE IN REMOTE REGIONS,
A. Barton, and D. C. Comrie.
Water and Pollution Control, Vol 118, No 5, p 14-16, May, 1980.

Descriptors: *Mine wastes, *Mine drainage, *Waste management, Wastewater management, Industrial wastes, Industrial wastewater, *Wastewater treatment, Uranium, Canada.

Mining operations generate significant quantities of waste materials requiring treatment prior to release to the environment. The natural environment in mining regions in Canada is often particularly sensitive to disturbances. The major waste stream from mining operations is tailings in the form of a slurry of fine particles and process water. Mine water may also present problems in mining operations where ore is located in permeable rock in the presence of a high water table. The nature of the contaminants in the waste streams, the geographical location of the mine, hydrologic and weather conditions in the area, local geomorphology, and the nature of the surrounding environment all affect the management of these mining wastes. Tailings slurries are generally pumped to storage ponds, where sands and slimes are allowed to settle out and metals and metallic salts are oxidized. Effluent from these primary treatment ponds may be treated with neutralizing reagents to raise the pH and remove dissolved heavy metals. The tailings storage areas and treatment ponds are usually surrounded by earthen embankments to reduce contact with surface water. Since treatment systems for mining operations have a limited life, the aspect of abandonment should be considered at the time of design. Regrading and revegetation of the tailings area to prevent subsequent leaching of the contaminants into ground or surface water systems is a common part of abandonment procedures. (Carroll-FRC)
W81-05684

AUSTRALIA: PROJECTS TO MATCH A GIANT LANDSCAPE,
For primary bibliographic entry see Field 8A.
W81-05693

FILTERS: TWO EVENTFUL DECADES OF DEVELOPMENT APPLICATION,
Water and Waste Treatment, Vol 23, No 3, p 47-48, 50, March, 1980. 2 Fig.

Descriptors: *Filters, *Filtration, *Water treatment, Wastewater treatment, Drinking water, Potable water, Water reuse, Well injection, Technology development.

Filtration technology has undergone significant development over the last 15-20 years. As a unit process filtration now covers a wide field compared to the previous uses. Upflow, multi-media and deep bed filters have broadened the field of application and permitted higher filter ratings with a greatly increased dirt holding capacity, thus reducing the filter area requirements for a given duty. Steps in filter development have been particularly logical, and were initially designed to avoid surface plugging by using the whole filter bed to retain solids and thereby obtain longer filter runs. This reasoning led to the graded filter bed, in which the raw water is passed through progressively finer media in an up-flow mode. Cleaning of high dirt capacity filters has always been a problem; unless efficient removal of retained dirt can be achieved the filter is useless. Filter cleaning is achieved by backwashing and air scourning. The Varivoid filter has a separate air distributor system to allow efficient cleaning by controlling bubble discharge and a controlled backwash system. Varivoid filters are used in continuous steel making, oil well water injection, water re-use, and potable water systems. The potential impact of this new filter is great in that the filter area requirements can be substantially reduced, thereby cutting capital requirements for such projects. (Baker-FRC)
W81-05694

5E. Ultimate Disposal Of Wastes

VERIFICATION OF OCEAN OUTFALL PERFORMANCE PREDICTIONS,
Caldwell Connell Engineers, Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 5D.
W81-05491

HEALTH RISKS OF ORGANICS IN LAND APPLICATION,
Cincinnati Univ., OH. Dept. of Environmental Health.
V. Majeti, and C. S. Clark.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 339-357, April, 1981. 5 Tab, 69 Ref.

Descriptors: *Land disposal, *Organic compounds, *Municipal wastes, Organic pesticides, Leaching, Public health, Regulations, Toxicity, Wastewater treatment.

A review is presented regarding various aspects of persistent toxic organic chemicals, including worker health effects, food chain effects, water quality effects, and recommendations for regulation. Land application systems tend to concentrate chemicals in the soil, enhancing the uptake of organics by plants and animals. The potential for groundwater pollution from leaching of waste landfills requires adequate prevention methods. For example, municipal sludges from Schenectady, New York and Bloomington, Indiana contained 23.1 ppm and 300 ppm PCBs, respectively. Municipal sewage in Hopewell, Virginia was contaminated by kepone. Organic chemicals in wastewater and sludge applied to land are probably affected by some of the same processes that affect the fate and behavior of organic pesticides. These include photodecomposition, chemical and microbiological decomposition, and detoxification by plants or weeds. Several acute toxic effects of organic chemicals have been reported by treatment plant workers when exposed to pesticide chemical wastes. These chemicals can be controlled by regulations controlling discharges to wastewater treatment systems, discharge standards for organics in wastewater effluents, or standards for the receiving bodies of water for toxic chemicals. (Small-FRC)
W81-05493

LAS VEGAS: GROWTH PLUS CLEAN WATER,
Clark County Sanitation District, Las Vegas, NV.
For primary bibliographic entry see Field 5D.
W81-05546

SEPTIC SYSTEM LONGEVITY INCREASED BY IMPROVED DESIGN,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5D.
W81-05551

CONTRIBUTION OF WASTEWATER DISCHARGES TO OCEAN SURFACE PARTICULATES,
Swanson-Oswald Associates, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W81-05552

THE INFLUENCE OF ORGANIC WASTES AND INORGANIC NITROGEN SOURCES ON SOIL NITROGEN, YIELD, AND ELEMENTAL COMPOSITION OF CORN,
Georgia Univ., Experiment. Dept. of Agronomy.
J. T. Sims, and F. C. Boswell.
Journal of Environmental Quality, Vol 9, No 3, p 512-518, July/September, 1980. 1 Fig, 8 Tab, 35 Ref.

Descriptors: *Sludge, *Land disposal, *Nitrogen, Heavy metals, Zinc, Chromium, Manganese, Fertilizers, *Crop yield, Nutrients, *Organic wastes.

The effectiveness of organic wastes was examined as a nitrogen source in the production of corn silage and grain. Plant tissues were monitored for metal concentrations. Of particular interest was the crop response to organic wastes supplemented with inorganic N. Treatments consisted of equivalent rates of N (224 kg/ha), as ammonium-nitrate, urea, sewage sludge, sewage sludge fortified with urea, leather tankage chemically fortified with urea-formaldehyde. Corn was used as an indicator crop, and soil N measurements were conducted throughout the growing season. The organic waste materials provided adequate amounts of available N for crop growth. Fortified and nonfortified wastes resulted in similar amounts of mineral and total N in the soil, indicating that fortification could reduce application problems associated with high loading rates of organic wastes. The loading rates used may have been slightly excessive. This excess could prove to be a source of contamination for groundwaters. Organic wastes consistently produced yields and plant tissue N levels equal to or greater than yields and N levels obtained with ammonium-nitrate or urea. Treatments increased Zn in plant tissue on sewage sludge plots. Manganese and Cr accumulations were increased in plant tissues grown on leather tankage treated plots. Crop growth and yield were generally not inhibited. (Baker-FRC)
W81-05563

SEPTIC SYSTEMS CAN BE VIABLE, LOW-COST ALTERNATIVES,
General Accounting Office, Washington, DC. Community and Economic Development Div.
H. Eschwege.
Water and Sewage Works, Vol 127, No 3, p 40, 50-51, March, 1980. 3 Fig.

Descriptors: *Septic tanks, *Wastewater disposal, Septic sludge, Wastewater treatment, Design criteria, Construction, Site selection, Soil porosity, Percolation.

Septic systems can be designed as effective long-term tools for wastewater disposal. They can provide as good or better treatment than central systems, use less energy, and replenish groundwaters. Septic systems can function effectively for 25-50 years. Proper performance of the system depends on the ability of the soil to absorb viruses, strain out bacteria, and filter wastes. Proper site evaluation requires accurate measurement of soil permeability, degree of slope, position of the water table, and depth of bedrock or other impermeable material. The percolation test is the most widely used indicator of soil permeability. There are some necessary maintenance and operation conditions. When the septic tank is not periodically cleaned, solids build up and enter the underground soil absorption field, blocking the flow of effluent into the soil. Maintenance is relatively simple, involving periodic pumping to remove accumulated solids from the tank. Excessive water usage by the homeowners can also cause problems by overloading the system. (Baker-FRC)
W81-05580

CHANGES IN SOIL PHYSICAL PROPERTIES DUE TO ORGANIC WASTE APPLICATIONS: A REVIEW,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Hydrology.
For primary bibliographic entry see Field 2G.
W81-05589

PRIMARY WASTES IN THE OLIVE OIL INDUSTRY,
R. M. Bradley, and L. Baruchello.
Effluent and Water Treatment Journal, Vol 20, No 4, p 176-177, April, 1980. 2 Fig, 1 Tab, 6 Ref.

Descriptors: *Olive industry waste, *Land application, *Waste characteristics, *Waste disposal, Industrial wastes, Oil wastes, Food-processing wastes, Waste treatment.

The characteristics, treatment, and disposal of wastes from the Italian olive oil industry are described. The widely used continuous process uses 0.5 liters of water per kg olives to facilitate pressing. The older batch process produces a more concentrated waste because it uses 0 to 0.2 liter of water per kg olives. A table lists the raw waste characteristics. Both wastes have no settlable solids, a trace of mechanically separable oil, a trace of ammonia-N, and a trace of phosphate. The pH is 4.9-5.0. Other properties of the batch process waste are as follows (in mg per liter): acidity, 1800; suspended solids, 600; dissolved solids at 105 degrees C, 60,000; volatile solids, 52; EEM, 160; BOD, 29,200; COD, 92,800; organic N, 9; and nitrate, 40. Properties of the continuous process waste are (in mg per liter): acidity, 930; suspended solids, 400; dissolved solids at 105 degrees C, 32,000; BOD, 18,600; COD, 60,000; organic N, 20; and nitrate, 20. A common method of disposal is land application without treatment. Treatment methods studied but found impractical for most mills were aeration, precipitation, filtration, and flotation. Pretreated olive waste with 4000 mg per liter lime, 2000 mg per liter N, and 300 mg per liter P and applied at the rate of 10 mm per day to a lettuce crop gave optimum yields. Lower chemical doses produced stunting; higher doses, retardation of early growth stages. (Cassar-FRC)
W81-05634

THE FIRST DISSOLVED AIR FLOTATION PLANT FOR WATER CLARIFICATION IN THE UK.
Water Services, Vol 84, No 1007, p 19-23, January, 1980. 7 Fig.

Descriptors: *Clarification, *Flotation, *Water treatment facilities, Water treatment, Aeration, Chemical treatment, Filtration, Chlorination, *United Kingdom.

The Bewl Bridge Treatment Works was the first purpose-built water treatment plant based on dissolved air flotation as the primary phase separation process in the United Kingdom. The works was designed as a semi-automatic unmanned base load station with stage 1 having a capacity of 11.35 M liters/day. After screening, the water is aerated in one of two tanks. Two flash mixers for dosing ferric sulfate, sodium hydroxide, chlorine, and activated carbon are located downstream of aeration. There are three two-stage flocculation tanks and three flotation cells. Clarified water from the flotation unit is filtered using rapid gravity sand filtration. Chlorination is the final treatment step. The sludge from the flotation process flows into two hopper bottomed holding tanks, and later it is pumped to lagoons for air drying. Continual automatic monitoring is provided by a control system comprising six local control consoles located strategically around the plant. (Small-FRC)
W81-05667

5F. Water Treatment and Quality Alteration

PROCESS FOR PURIFYING WATER CONTAINING FLUORIDE ION,
Andco Industries, Inc., Cheektowaga, NY. (Assignee).
S. Bruckenstein.
U.S. Patent No 4,226,710, 8 p, 4 Tab, 8 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 250. October 7, 1980.

Descriptors: *Patents, *Water treatment, *Water purification, Separation techniques, Chemical reactions, Chemical precipitation, Fluorides.

A process for purifying water containing fluoride comprises precipitating fluoride from the water as fluorapatite in the presence of a bed of seeding composition. Fluoride is removed as fluorapatite by having sufficient available calcium for each mole of fluoride present in the water and sufficient available phosphate for each mole of fluoride in the water to form a precipitate which is or converts to sufficient fluorapatite to remove essentially all fluoride from the water. (Sinha-OEIS)
W81-05423

TREATING DEVICE FOR LARGE BODIES OF WATER,
For primary bibliographic entry see Field 5G.
W81-05427

COMPUTERS IN THE WATER INDUSTRY,
Ferranti Computer Systems Ltd. (England).
For primary bibliographic entry see Field 7B.
W81-05483

CONTINUOUS DO SIMULATION AT SPRINGFIELD, MISSOURI,
CH2M/Hill, Inc., Gainesville, FL.
For primary bibliographic entry see Field 5C.
W81-05533

FLOW APPROACHING FILTER WASHWATER TROUGHS,
Camp Dresser and McKee, Inc., Boston, MA.
J. A. French.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE2, p 359-377, April, 1981. 9 Fig, 1 Tab, 8 Ref.

Descriptors: *Filtration, *Backwash, *Mathematical models, Flow, *Water treatment, Nonuniform flow, Hydraulic design.

The upflow of backwash water from the bed to the troughs or sidewall weirs of a wastewater filter is discussed. Fluidization is reviewed, and a potential flow model is introduced. For a given trough spacing, the round bottom trough that minimizes the region of nonuniform flow above a filter bed is one with external total width equal to 0.25 times the center-to-center spacing, and with external total draft equal to 0.20 times the center-to-center spacing. With this design, there is also more efficient flushing of floc particles from the filter than in larger and smaller troughs. Decreasing trough spacing can also reduce the nonuniform flow region and produce more efficient flushing. There are, however, practical lower limits to trough spacing. The computational techniques presented may be used to model other shapes of trough or to model more realistic frequency distributions of settling velocity of the floc particles. (Small-FRC)
W81-05543

PIPE STORAGE FOR EQUALIZATION OF BACKWASH DISCHARGES TO SANITARY SEWERS,
Randolph and Associates, Inc., Peoria, IL.
For primary bibliographic entry see Field 8A.
W81-05554

INSTRUMENTATION FOR CLEAN AND DIRTY WATER,
Thames Water Authority, London (England).
For primary bibliographic entry see Field 7B.
W81-05632

DESIGN AND OPERATION OF CONDENSATE POLISHING AT CEGB FAWLEY,
Central Electricity Generating Board, Southampton (England). Marine Lab.
G. R. Mills, and H. R. Bolton.
Effluent and Water Treatment Journal, Vol 20, No 2, p 55-58, 60, February, 1980. 2 Fig, 2 Tab, 4 Ref.

Descriptors: *Condensers, *Boiler water, *Ion exchange resins, Powerplants, Leakage, Seawater, Water purification, Water treatment, Design criteria.

The problem of seawater contamination of boiler water at the Fawley Power Station, Southampton, was solved by installation of 100% condensate polishing on all units between the condenser extract pumps and the inlet to the condensate coolers. A naked mixed bed ion exchange system was installed to handle condenser leakage up to 400 micrograms per liter on a long term basis and 1000 micrograms per liter on a short term basis. Boiler water chloride levels can be controlled at less than 0.5 mg per liter. Outlet conductivity is maintained at 0.08 microS per cm. An incident of heavy condenser leakage caused an outlet conductivity of 0.14 microS per cm, but at this point ion exchange resins were in need of regeneration. The plant design, operation, and maintenance and the resin performance are described in detail. (Cassar-FRC)
W81-05635

BLACKHEATH WATER TREATMENT PLANT, CAPE TOWN,
J. G. Brand.
Civil Engineer in South Africa, Vol 23, No 2, p 63, February, 1981.

Descriptors: *Water treatment, *Water treatment facilities, *Urban hydrology, Groundwater mining, Water demand, Raw water, Water reuse, Wastewater renovation, Reservoirs, Potable water, *Cape Town, South Africa.

The Cape Town water treatment plant at Blackheath is described. The plant treats the City Council's allocation of raw water from the Riversonderend/Berg/Eerste Rivers (RSE) water augmentation scheme. All of the waterworks were designed by the City Engineer's Department. The method of treatment used depends on the quality of the raw water. Standard procedures include horizontal flow settling followed by downward-flow rapid sand filtration. Pipelines leading to the Blackheath plant connect to the Stellenbosch part of the tunnel system and to a pretreatment facility at Wemmershoek. Supplies from the RSE scheme are projected to meet the urban water demands of the Western Cape until 1987-88. Lack of funding has postponed work on a reservoir at the Blackheath facility. Recycling of purified waste water and groundwater pumping are being studied as alternate supplies of water. (Geiger-FRC)
W81-05644

SLOW SAND FILTER DESIGN AND CONSTRUCTION IN DEVELOPING COUNTRIES,
National Environmental Engineering Inst., Nagpur (India). Water Engineering Div.
R. Paramasivam, V. A. Mhaisalkar, and P. M. Berthouex.
Journal of the American Water Works Association, Vol 73, No 4, p 178-185, April, 1981. 3 Fig, 5 Tab, 6 Ref.

Descriptors: *Developing countries, *Sand filters, *Water treatment facilities, Rural areas, Municipal water, Water treatment, Facility design, Design criteria, Economic aspects, Cost analysis, Filtration, Planning.

In developing countries where financial resources are strained by numerous competing demands, the major consideration in the planning and design of water supply systems should be that of supplying water to the greatest number of people with optimal use of funds. The design should be realistic and adequate for the intended service, relying on materials and equipment manufactured or available locally and matched to the skill level of available operating and maintenance personnel. Slow sand filtration has many advantages for villages and small towns in that it provides a single-step treatment for raw water with low turbidity, has low operating costs, and is reliable. Basic design considerations are discussed, including evaluation of population and per capita supply, rate of filtration, continuous versus intermittent operation, number of filter beds, filter shape and plant layout, depth of filter box, and choice of filter sand and gravel. If optimal filter dimensions are used, the number of filters can be increased at almost no extra cost so as to achieve flexibility and reliability in operation. A model for filter costs is discussed. Application of the model indicates that there is no economy of scale when constructing slow sand filter facilities. It is recommended that national strategies for water supply development should provide for system expansions at intervals of about 10 years rather than to plan construction of large initial plants which contain treatment capacity which will not be needed for 10 or 20 years. Possibilities for reducing the costs of developing safe water supplies which could be investigated include standardization of the design of systems to include only a small number of model capacity and layout designs, from which villages would select the most suitable model, and prefabrication of components. (Carroll-FRC)
W81-05654

ARDINGLY RESERVOIR AND ASSOCIATED WORKS,
For primary bibliographic entry see Field 8A.
W81-05661

LATEST TECHNOLOGY FOR CHEAM WATERWORKS.
Water Services, Vol 84, No 1009, p 157-158, 160. March, 1980. 5 Fig.

Descriptors: *Water treatment facilities, *Water softening, *Telemetry, Ion exchange, Water distribution, Control systems, Water treatment.

The Sutton District Water Company has built a new waterworks at Cheam. This plant uses modern technology to soften and treat water at the rate of 90 million liters per day. Water is chlorinated at 1 mg per liter residual as it leaves the boreholes in the chalk. After ample contact time chlorine is reduced to 0.2 mg per liter by SO2 addition. Water with an average hardness of 290 mg per liters is reduced to 125 mg per liter by dealkalization. Ca and Mg are adsorbed by ion exchange resins, which release hydrogen ions. Bicarbonates are removed as CO2 in the aeration towers. A telemetry control room monitors operation of boreholes, pumping stations, and reservoirs. It consists of a central computer and 19 remote terminal units. This system has eliminated most manual checking and has cut down requirements for night and weekend staff. (Cassar-FRC)
W81-05673

CORROSION INHIBITORS IN DISTRIBUTION SYSTEMS,
Water Research Centre, Marlow (England).
R. G. Ainsworth.
Water Services, Vol 84, No 1009, p 145-148, 154. March, 1980. 2 Fig, 14 Ref.

Descriptors: *Corrosion control, *Color removal, *Inhibitors, Water distribution, Water mains, Pipes, Silicates, Phosphates, Potable water, Iron.

In distribution systems corrosion inhibitors are used to improve the water quality, rather than to prolong the life of the pipes. An inhibitor for a potable water supply must not cause a short or long term health hazard. In addition, it should be cheap, easy to handle, easy to dose, and effective. Sodium silicates, sodium polyphosphates, and pH correction satisfy these conditions. Sodium silicates have the general formula Na2O.xSiO2, where x = the mole ratio of silica to sodium oxide. An x value of 3.3 is recommended for waters of pH greater than 7; a value of 2 for waters below pH 7. Silicates work only in the presence of oxygen, forming a protective gel over the surface, and are especially useful in badly corroded and tuberculated pipes. Initial dosage is 8-16 mg per liter as SiO2. Polyphosphates complex with metal ions and form a film. This material is not effective in stagnant areas. An initial dose is 15 mg per liter, later reduced to 1-5 mg per liter. The effect of pH correction may be negligible in hard groundwaters and soft upland sources, but worth a try on intermediate lowland surface supplies. Discolored water may have many causes other than corrosion; therefore, inhibitors are not an automatic cure for this problem. Each system behaves individually. Several successful case histories are reported. (Cassar-FRC)
W81-05678

5G. Water Quality Control

EFFECT OF OXIDATION OF SOIL ORGANIC MATTER ON WATER QUALITY: ROLE OF NITRIFICATION AND DENITRIFICATION,
Florida Univ., Gainesville. Water Resources Research Center.
R. L. Tate, and R. E. Terry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-103946, Price codes: A05 in paper copy, A01 in microfiche. Publication No 55, 1981. 84 p, 9 Fig, 23 Tab, 76 Ref.

Descriptors: Nitrogen, Histosols, *Denitrification, *Nitrification, Saturated soils, Subsidence, *Organic soils, *Oxidation, *Water quality, Soil properties, *Florida.

Since mineral nitrogen produced in Histosols has a significant effect on regional water quality, nitrification and denitrification and the effect of the physical and chemical environment on these reactions were studied in Pahokee muck, a drained Histosol. Highest potential denitrification rates were detected in cultivated fields. These rates were about 3-fold that of a soil from a fallow field. Nitrite accumulated in low concentrations in the soils as a result of denitrification. Denitrification was limited by carbon in uncultivated soils, but not in the soils from the sugarcane or grass fields. Oxygen was limiting to denitrification in drained soils since during flooding the denitrification capacity and denitrifier populations increased, while soil nitrate levels decreased about 80 percent. Although large populations of heterotrophic nitrifiers were found in Pahokee muck, studies of population densities and changes in soil that had been heated to kill the nitrifiers but not the heterotrophs demonstrated that autotrophic nitrifiers were the sole population responsible for nitrification.
W81-05354

LAND USE SHIFTS AND A QUALITY ENVIRONMENT,
Soil Conservation Service, Washington DC.
For primary bibliographic entry see Field 4D.
W81-05356

THE ROLE OF CONSERVATION DISTRICTS IN URBAN EROSION AND SEDIMENT CONTROL,
National Association of Conservation Districts, Harper, KS.
For primary bibliographic entry see Field 4D.
W81-05357

PRESENT URBAN EROSION CONTROL TECHNIQUES,
Soil Conservation Service, Washington, DC. Engineering Div.
For primary bibliographic entry see Field 4D.
W81-05360

RETENTION BASINS FOR CONTROL OF URBAN STORMWATER QUALITY,

Southeast Michigan Council of Governments, Detroit.
R. P. Akeley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 69-78, 3 Fig, 6 Tab.

Descriptors: *Settling basins, *Urban runoff, *Storm runoff, *Water quality control, Precipitation, Suspended solids, Nutrients, Heavy metals, Cost analysis, Oakland County, Michigan.

The Southeast Michigan Council of Governments (SEMCOG) has investigated a number of methods for the control of urban stormwater pollution and is currently evaluating the effectiveness of stormwater retention basins for control of runoff water quality from subdivisions and commercial/light industrial development in Oakland County, Michigan. Three residential and three commercial/light industrial catchments will be sampled over a two year period. Snowmelt and rain runoff quality, quality and quantity of discharge, precipitation intensities and accumulations at 10-15 min intervals, particle size distribution of solids in influent and effluent of the basins, and the quality of the residual materials removed in the basin will be assessed. Prior research has shown that a large percentage of suspended solids and nutrients, especially phosphorus, and heavy metals are removed by retention basins, with the amounts depending on particle size. At the end of the project it is expected that reliable data will be available to determine the cost-effectiveness of a decentralized stormwater quality control system that is built into the development process. (Brambley-SRC)
W81-05361

METHODS FOR CONTROLLING EROSION AND SEDIMENTATION FROM RESIDENTIAL CONSTRUCTION ACTIVITIES,
Wisconsin Dept. of Natural Resources, Madison.
B. B. Hagman, J. G. Konrad, and F. W. Madison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 99-105, 1 Tab.

Descriptors: *Erosion control, *Sediment control, *Construction, *Urbanization, Sediment transport, Planning, Drainage, Land use, Environmental effects, Water pollution control, Nonpoint pollution sources, *Wisconsin.

Land development for residential uses can cause sediment to be transported into waterways but preventive measures are available which help to reduce sediment loss. An investigation of two developments in Wisconsin examined the use of on-site measures before and after plat development. Before plat development, site selection and planning is the major factor in sediment and erosion control. By choosing an area with suitable soil, grade, and water table, and designing the plat with reference to natural drainage and vegetation, land disturbance can be kept to a minimum, with corresponding reductions in cost and sediment. Control measures such as minimal soil disturbance, protection of exposed soil, and use of porous pavement and protective buffers can reduce erosion during plat development. During construction, sediment can be controlled by limiting exposed and unprotected soil, placing mounds of soil far from streets, limiting vehicle access to lots, and directing water flow into protected areas. Some of these measures cost money, others require only planning. Controls may be made mandatory by legislation, but effective control depends on education on the problem, information on solutions, development of design standards and specifications, and the cooperation of all interested parties. (Brambley-SRC)
W81-05364

EROSION CONTROL AND STORM WATER MANAGEMENT FOR URBAN SOIL SEDIMENT POLLUTION ABATEMENT, A WORKABLE OHIO STANDARD,
Ohio Dept. of Natural Resources, Columbus.
For primary bibliographic entry see Field 4D.
W81-05371

OIL SPILL RECOVERY METHOD AND APPARATUS,
L. M. Meneghetti, and H. A. Cain.
U.S. Patent No 4,226,711, 6 p, 5 Fig, 8 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 251. October 7, 1980.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water quality control, Equipment, Absorption, Clays, *Oil recovery.

The recovery of oil in an oil spill on water is achieved by a medium which not only absorbs the oil but causes it to become heavy and lose its buoyancy in relation to water so it can be made to sink. The apparatus effects the deposit of the medium upon the oil and collects the sinking oil below the surface before it attaches itself to the bottom. The oil treating medium or agent comprises a dry clay and a ballasting flux which together function to separate oil from water and renders the oil capable of being captured in a collecting container. The apparatus consists of a floating structure which carries a dispensing unit for the mixed clay and its ballast, as well as a submerged recovery unit which functions with the dispensing unit to collect and contain the sinking oil. The floating structure may be self propelled. (Sinha-OEIS)
W81-05424

TREATING DEVICE FOR LARGE BODIES OF WATER,
R. B. Woltman.
U.S. Patent No 4,226,719, 7 p, 5 Fig, 9 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 253. October 7, 1980.

Descriptors: *Patents, *Lakes, *Water treatment, *Water quality control, Aeration, Turbulence, Equipment, Chemical reactions, Water circulation, *Eutrophication control.

A device simultaneously aerates and chemically treats lakes to prevent or retard the process of eutrophication. The device has a venturi outlet passage for the discharge of a pressurized stream of water and a venturi inlet chamber spaced upstream, as well as a mixing chamber in which air and treating chemicals can be turbulently ingested into the stream. The device is positioned underwater for use with open line extending from the mixing chamber to a point above the water surface. A nozzle is attached to the venturi outlet passage. This nozzle has a pair of side openings to draw water into the stream passing through the outlet passage to give the stream greater density and turbulence as it leaves the nozzle. Also, the venturi outlet passage has three communicating chambers with walls shaped to create turbulence in the stream even before it reaches the nozzle. To operate the device, pressurized water is pumped into the venturi inlet chamber to create a partial vacuum in the mixing chamber that sucks air into that chamber through the line connecting it with the atmosphere. A treating chemical such as copper sulfate can be charged into the open upper end of the line for ingestion in the stream of water passing through the device at the same time as air is being sucked through the line. (Sinha-OEIS)
W81-05427

REMOVING OIL FROM WASTE WATER WITH SULFUR,
Amoco Production Co., Tulsa, OK. (Assignee).
L. W. Jones.
U.S. Patent No 4,226,722, 9 p, 6 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 999, No 1, p 254. October 7, 1980.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Water quality control, Separation techniques, *Oily water, Oil pollution, *Sulfur, Coalescence.

A method of removing dispersed oil from water by contacting the oily water with sulfur to cause the oil to coalesce or agglomerate is described. In a preferred embodiment, the water containing the dispersed oil is flowed through a bed of granular media of granular sulfur or sulfur coated sand, which presents a surface area of solid phase sulfur to coalesce the dispersed oil. The coalesced oil is then separated from the water. In another embodiment, a sulfur slurry is mixed with the oily water to cause the oil to coagulate with the sulfur. A separator, such as a cyclone separator, separates the coagulate from the water. (Sinha-OEIS)
W81-05429

STREAM REAERATION BY VELZ METHOD,
New Mexico Univ., Albuquerque. Dept. of Civil Engineering.
R. J. Heggen.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 283-287, February, 1981. 2 Fig, 1 Tab, 11 Ref.

Descriptors: *Mathematical models, *Instream aeration, *Algorithms, Computer models, *Aeration, Dissolved oxygen, Mathematical studies, Willamette River.

The model of Clarence Velz was used to successfully predict atmospheric reaeration over a river's entire length. A direct solution for the Velz algorithm is presented, and the model is transformed to a K2-equivalent (the conventional reaeration coefficient) reaeration estimate for the Willamette River. The Velz methodology was more successful than K2-based modeling. The direct solution of the method is computationally superior to the original tabular and graphical trial and error steps. The Velz algorithm for dissolved oxygen modeling should be employed for regime-varied rivers where K2 formulation does not appear to be consistent or satisfactory. For the Willamette, loadings, temperature, and hydraulic dimensions were required for 296 reaches. The success of the Velz algorithm is due in a large part to the use of such short reach regimes and the fact that it distinguishes between normal and tidal regimes. (Small-FRC)
W81-05523

EFFECTIVENESS OF VEGETATED BUFFER STRIPS IN CONTROLLING POLLUTION FROM FEEDLOT RUNOFF,
Science and Education Administration, Morris, MN. North Central Soil Conservation Research Lab.
R. A. Young, T. Huntrods, and W. Anderson.
Journal of Environmental Quality, Vol 9, No 3, p 483-487, July/September, 1980. 3 Fig, 6 Tab, 17 Ref.

Descriptors: *Feedlot runoff, *Water pollution control, Cropland, Agricultural runoff, Runoff, Animal wastes, Feedlot wastes, Barn wastewater, Farm wastes, Absorption, Feedlots, *Vegetation effects.

Different management techniques were examined for control of discharge of pollutants below active feedlots. The ability of the land and cropping practices to absorb and retain pollutants in runoff from livestock feedlots was specifically examined. Total solids and dissolved nutrients in runoff were reduced by all cropping treatments examined. As runoff and entrained solids passed through the vegetated buffer strips, they were reduced an average of 67 and 79%, respectively. Total nitrogen in runoff was reduced 84%, total ammonium-nitrogen 63%, total phosphorus 83%, and phosphate-phosphorus 76%. However, average nitrate-nitrogen values in runoff increased about 9% due to the fact that some nitrate-nitrogen was picked up from the sorghum-sundangrass and oat plots. Runoff and entrained solids were reduced most on corn plots. Solids transported in runoff from corn plots were reduced 86%, as compared with 66% from orchardgrass, 82% from sorghum-sundangrass, and

75% from oats. The larger reductions in soil and water losses from the corn plots may have been caused by the corn rows retarding runoff, as they were planted across the slope. Whenever narrow rectangular field plots are tilled and planted across slope there is a risk of overestimating the effectiveness of the treatment in reducing soil and water losses as compared with treatment effects on large size fields. However, even taking this bias into consideration, the reductions seen here are large. (Baker-FRC)
W81-05565

GROUNDWATER CONTAMINATION IN CONNECTICUT,
Connecticut Dept. of Health, Hartford.
For primary bibliographic entry see Field 5B.
W81-05613

IMPROVING THE DEVELOPMENT OF WATER QUALITY STANDARDS,
For primary bibliographic entry see Field 6E.
W81-05623

WATER POLLUTION CONTROL BY AGREEMENT: THE FRENCH SYSTEM OF CONTRACTS.
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 6E.
W81-05630

THE IMPORTANCE OF FLOW MEASUREMENT,
Water Research Centre, Marlow (England).
For primary bibliographic entry see Field 7B.
W81-05633

WHO ACTIVITIES RELATING TO RIVER POLLUTION IN EUROPE,
World Health Organization, Copenhagen (Denmark).
J. I. Waddington.
Effluent and Water Treatment Journal, Vol 20, No 3, p 122, 124-126, March, 1980. 5 Ref.

Descriptors: *World Health Organization, *Rivers, *Water quality, Water pollution control, *Europe, Industrial wastes, International agencies, Environmental impact.

The World Health Organization regional office for Europe in Copenhagen is concerned with the environmental health priorities of an industrialized society. The environmental pollution unit has a wide range of water pollution projects underway in cooperation with individual governments and on an intercountry basis. A three-volume manual was published in 1979, covering analysis of polluted waters. The toxicity unit is involved with chemical hazards to man from all routes including water. The environmental health services unit assists governments in water pollution control services. Among the many concerns of the WHO are development of international conventions for control of pollution in coastal waters and rivers such as the Danube. River pollution control projects are being carried out in many countries: Czechoslovakia, organic and industrial wastes: Greece, environmental impact of a proposed water transfer; Hungary, model development for the Danube at Budapest; Malta, recharging of aquifers with sewage effluents; Morocco, eutrophication of a new public water supply reservoir; Poland, industrial and saline wastes; Romania, waste treatment; Spain, waste treatment and river pollution monitoring; Turkey, river water quality standards; and Yugoslavia, industrial pollution and river regulation. (Cassar-FRC)
W81-05637

BATTLING FOR--AND AGAINST--WATER,
L. Freeman.
Water, No 35, p 16-18, November, 1980.

Descriptors: *Netherlands, *Water supply development, *Water quality management, Groundwater, Rivers, Meuse River, Rhine River, Water pollution, Municipal water, Waterschappen, Polders, Deltas, Drainage, Land reclamation.

The Netherlands consists basically of the deltas of two rivers, the Rhine and the Meuse, the land of which has been reclaimed for use by humans through a complex system of natural and artifical dikes. Much of this area lies below sea level. The central government is responsible for the management of water in major rivers, canals, and estuaries. The provinces, through the 'waterscappen', are responsible for the 'polders', which are land below sea level. Municipalities are responsible for the domestic water supply. Waterschappen are also responsible for sewage disposal, which can be accomplished by flushing wastewater through the polders and then pumping it into the perimeter canals which serves as storage basins. Water from the canals can be used for public supply after further treatment by the municipal water companies. About 65 percent of the current water supply is abstracted from groundwater sources, which are abundant in the eastern and southern parts of the country. Surface water comes from the Rhine and the Meuse. Since the Meuse is a rain-fed river, storage basins are needed for drought periods. The Rhine, on the other hand, is seriously polluted and its water requires sophisticated treatment prior to acceptance into the public distribution system. An international group of water managers is currently working to improve the quality of water in the Rhine, mostly through emphasis on the treatment of wastewater prior to discharge to the river. Over 99 percent of the population of the Netherlands lives in residences connected to public water supply systems. Water demand is expected to double by the year 2000. While much of this increase is expected to come from increased use of groundwater, more water will also be needed from the rivers. Although many water managers support the idea of merging water supply and wastewater management through amalgamation of the water companies and the waterschappen, the Dutch government is not yet supportive of this development. (Carroll-FRC)
W81-05688

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE USE OF SOILS INFORMATION IN THE PLANNING PROCESS: PROBLEMS AND PROSPECTS,
Isberg, Riesenberg, Chelseth and Associates, Inc., Minneapolis, MN.
G. C. Isberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 227-235.

Descriptors: *Soil properties, *Land use, *Planning, *Erosion control, Community development, Regional development, Soil erosion, Water quality control, Wastewater treatment, Soil types.

Much current development, whether it consists of residential, commercial or industrial developments, continues to take place with little or no consideration of the effects of the development on natural resources and vice versa. Problems which develop include flooded basements, inoperative private sewer systems, cracked or shifting foundations, soil erosion leading to waterway pollution, and damage to buildings and highways. Soils information can be extremely useful in both the planning and development process in order to minimize costly development problems for homeowners as well as local government units. The soils information can be used in a variety of ways in the total planning and development process ranging from simple subdivision to serving as a basis for rather complex comprehensive plans for a community or region. The following are some recommendations for encouraging the use of soils information in the planning process: improved communication between the soil scientists and those involved in the planning and development process; development of additional and more exacting soils standards; and the development of incentive programs at the federal or state level. (Moore-SRC)
W81-05377

MULTIJURISDICTIONAL STORMWATER MANAGEMENT: THE FOUR MILE RUN WATERSHED PROGRAM,
Northern Virginia Planning District Commission, Falls Church, VA.
For primary bibliographic entry see Field 4A.
W81-05382

INVESTIGATION OF THE HURST COEFFICIENT AND OPTIMIZATION OF ARMA MODELS FOR ANNUAL RIVER FLOWS,
Purdue Univ., Layfayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W81-05437

GROUNDWATER RESOURCES OF KWAJALEIN ISLAND, MARSHALL ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W81-05442

NUMERICAL ANALYSIS OF FLOW IN SEDIMENTATION BASINS,
Utah Univ., Salt Lake City. Dept. of Civil Engineering.
D. R. Schamber, and B. E. Larock.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY5, p 575-591, May, 1981. 4 Fig, 28 Ref.

Descriptors: *Sedimentation basins, *Flow velocity, Velocity, Flow, Flow characteristics, Flow measurement, Wastewater facilities, Wastewater treatment, *Model studies, Mathematical models, Viscosity, Physical properties, Eddies.

A numerical model is described which predicts the velocity field in sedimentation basins. As the flow is turbulent within large basins and tanks, determination of the velocity field is difficult. Point velocities within the basin are determined by the finite element solution of five coupled, nonlinear partial differential equations. The structure of the turbulence is represented by an effective or 'eddy' viscosity model which depends on the turbulent kinetic energy and its rate of dissipation. Once the velocity field is determined, the distribution of particle concentration throughout the basin could be obtained by solution of a linear convection-diffusion equation. The computed velocity field clearly indicates the existence of a nonuniform recirculating flow pattern within the basin. This paper has shown that the modeling of flow in settling basins can be improved in several ways by additional research. (Baker-FRC)
W81-05481

RIVER QUALITY MODEL FOR URBAN STORMWATER IMPACTS,
Duke Univ., Durham, NC. Dept. of Civil Engineering.
M. A. Medina, Jr., W. C. Huber, J. P. Heaney, and R. Field.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 107, No WR1, p 263-280, March, 1981. 8 Fig, 1 Tab, 18 Ref.

Descriptors: *Water pollution control, *Urban runoff, *Storm water, *Water quality, *Rivers, Urban drainage, Runoff, Storm runoff, Combined sewers, Hydrologic models, Wastewater treatment, Model studies, Alternative planning, Planning, Computer programs, Mathematical models, Storm sewers.

A simplified river quality model was developed for preliminary evaluation of the impact of areawide

urban wastewater treatment alternatives on receiving water quality. The model simulates the stream response to separate and combined effects of waste inputs from upstream sources, dry weather urban sources, and wet weather urban sources. The model may be interfaced with other hydrologic simulation models and can consider a large number of wastewater inflow combinations, dry weather flow and wet weather flow treatment rates, and upstream flow conditions. This model, referred to as Level III-Receiving, has no limitations to size of catchment or number of storm events. An application to Des Moines during 1968 showed that wet weather control should be considered after a secondary treatment technology has been achieved to control dry weather wastewater inputs. (Cassar-FRC)
W81-05627

SCALE-MODELLING IN SURFACE AERATION SYSTEM DEVELOPMENT,
For primary bibliographic entry see Field 5D.
W81-05679

METHODS USED TO PROVIDE SERVICES TO OUTLYING MINE TOWNSITES,
G. A. Allen.
Water and Pollution Control, Vol 118, No 5, p 18-19, May, 1980. 1 Fig.

Descriptors: *Rural areas, *Municipal wastewater, *Municipal water, Wastewater treatment, *Water supply, Water conveyance, Water treatment, Canada, Economic aspects, Planning.

The location of most producing mines in Canada in remote northern areas has led to the development of mine townsites to attract and keep trained personnel. The provision of water supplies and sewage disposal systems for these towns can present many problems. Costs for providing these services often range between $20,000 and $30,000 per lot. The availability and quality of ground and surface water should be carefully evaluated. Surface water generally requires treatment by filtration followed by classification, while only disinfection is generally required for ground water. The quantity of water needed will be determined by domestic, commercial, and fire protection requirements. Water distribution systems generally involve either pumping water to an elevated storage tank or continuous pumping from an on-grade storage tank. The water distribution piping in northern townships often needs to be constructed at shallow depths above the frost line or above grade. Insulation or heat tracing may be required to prevent freezing. Sewage collection systems for these towns often consist of pressure collection systems using collector pipelines laid insulated at shallow depths or placed in heated above-ground utilidors. Sewage treatment and/or disposal may consist of discharge to a mine tailings area, lagooning, or treatment in a package sewage treatment plant, generally the rotating biological contactor or extended aeration treatment. (Carroll-FRC)
W81-05682

6B. Evaluation Process

ARID BASIN MANAGEMENT MODEL WITH CONCURRENT QUALITY AND FLOW CONSIDERATIONS: PHASE III,
Nevada Univ. System, Reno. Water Resources Center.
J. W. Fordham, R. L. Bateman, A. B. Cunningham, and T. D. Chiatovich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-103912, Price codes: A07 in paper copy, A01 in microfiche. Publication No 42036, 1980. 169 p, 26 Fig, 16 Tab, 38 Ref, 7 Append.

Descriptors: *Computer models, *Management planning, *Water quality, *Water resources management, Water supply, Operating criteria, Rivers, Climates, *Nevada, Truckee River, Carson River.

This report is the third and final report of a three-phase research project. The primary objective of the overall project was to develop an inorganic water quality-flow management model in which both water supply and quality criteria are considered in the development of operating policy and to demonstrate the use of the combined model in a real-world situation. This was done by developing a water quality model for the Carson River for use with a Truckee-Carson management model and an existing Truckee quality model. A second objective of the research was projection of water quality of Carson sub-basins by applying predictive techniques developed on the Tahoe-Truckee System. A third objective was to examine long term hydrology behavior, making use of such climatic indicators as three growth (ring widths). The report includes a report on the first three phases, as well as an in-depth review and analysis of the study area and the data obtained. The 26 figures contained in the report graphically represent the data and schematically depict two river systems and locations of key control points. Computer programs used in data analysis are included in the appendices.
W81-05351

COST EFFECTIVE ANALYSIS OF CONSTRUCTION EROSION CONTROL AND IMPLICATIONS FOR PLANNING IN SOUTHEASTERN WISCONSIN,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4D.
W81-05365

ALLEN CAMP UNIT; PIT RIVER DIVISION: CENTRAL VALLEY PROJECT, CALIFORNIA.
Water and Power Resources Services, Sacramento, CA. Mid-Pacific Region.
Concluding Report, May, 1981. 43 p, 8 Fig, 3 Tab, 1 Append.

Descriptors: *Water resources development, *Economic feasibility, *Irrigation, *Wildlife management, *Dams, Flood control, Recreation, Area redevelopment, Multipurpose reservoirs, Water rights, *California, Cost-benefit analysis, Allen Camp Dam.

This report on the Allen Camp Unit of the Central Valley Project summarizes information on the plan for development of the water resources of the upper Pit River basin. The main feature of the Allen Camp Unit would be 90,000 acre-foot capacity Allen Camp Dam and Reservoir. Flows of the Pit River would be stored and regulated for irrigation, and fish and wildlife development. Other project benefits would include flood control, recreation, and area redevelopment. The multiple-purpose plan of development was found to be economically infeasible under present planning criteria. Irrigation costs exceed benefits, and incidental flood control benefits combined with fish and wildlife benefits are insufficient to justify construction of Allen Camp Dam. It is possible that development of the Big Valley National Wildlife Refuge without a supplemental water supply furnished by Allen Camp Reservoir could be justified. The refuge would be designed to maximize use of the water right entitlements of the refuge lands and surplus flows of Ash Creek. (Moore-SRC)
W81-05390

ECONOMIC IMPACTS OF IRRIGATION TECHNOLOGIES IN THE SEVIER RIVER BASIN,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3F.
W81-05439

RELATIONSHIP OF DESIGN CAPACITY TO EFFLUENT QUALITY,
Northampton County Area Community Coll., Bethlehem, PA.
D. E. Heath.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2270-2275, August, 1980. 4 Tab, 14 Ref.

Descriptors: *Wastewater treatment, *Water quality, *Environmental effects, Effluents, Efficiencies, Planning, Design, Statistical studies, Wastewater facilities, Economic efficiency.

A statistical investigation was performed to aid planners in assessing the net environmental impact of wastewater treatment plant centralization. Wastewater effluents from 29 treatment plants in New York and New Jersey were compared in relation to the design capacities of the plants, using BOD and suspended solids as parameters of water quality. Statistical analysis showed that smaller plants (less than 30 mgd capacity) generally produced a higher quality effluent under both average and extreme conditions and had less environmental impact than the larger plants (largest considered in this survey, 310 mgd). Groups of decentralized small plants may have an environmental advantage over a centralized system. This fact should be considered in sewerage planning in addition to economic efficiency and political constraints. (Cassar-FRC)
W81-05575

COMBINED SEWER OVERFLOW CONTROL--MARGINAL BENEFIT VERSUS COST ANALYSIS,
CH2M/Hill, Bellevue, WA.
D. T. Reynolds, J. L. Butt, and J. G. Goetz.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 497-504, April, 1981. 11 Fig, 1 Tab, 3 Ref.

Descriptors: *Combined sewer overflows, *Storm runoff, *Cost-benefit analysis, Overflow, *Flow control, Sewer systems, Marginal costs, Bremerton, Washington, Water pollution control, Alternative planning, Runoff, Wastewater treatment.

The marginal benefits versus costs are used as a basis for selecting an alternative for reducing frequency and volume of combined sewer overflows. The method defines each combined sewer outflow location as a node, allowing separate consideration of the costs involved with each overflow point. A design flow capacity based on the design rainfall intensity is established for each node. A computer model estimates the annual frequency and volume of overflow at each node. This method was used to develop strategy for combined sewer outflow control in Bremerton, Washington, population 35,000. Three alternatives were evaluated for each of the overflow points--transport and secondary treatment, screening and disinfection, and storage in reservoirs at each overflow point, followed by secondary treatment. Transport and treatment was the most cost effective method for most modes. Screening and disinfection was cost effective at one node. Storage was not cost effective at any node. At a cost of $3.1 million (a 23% increase in capital costs) 92% control was achieved. For 100% elimination of overflows, $6.6 million would be required. (Cassar-FRC)
W81-05619

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

NON-MARKET VALUATION OF WATER IN RESIDENTIAL USES,
Florida Univ., Gainesville. Water Resources Center.
K. C. Lewis, and R. R. Carriker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB82-103953, Price codes: A06 in paper copy, A01 in microfiche. Publication No 57, 1981. 94 p, 5 Fig, 11 Tab, 72 Ref.

Descriptors: Water resources planning, *Comprehensive planning, *Water resources development, *Water supply systems, *Pricing, *Residential water use, Water demand, Water management.

Increases in water demands were historically met through the augmentation of water supply facilities. However, the most easily developed water sources have already been tapped, and water pollution adds to the cost of developing some water sources. Given the increased cost and difficulty of water supply augmentation, more attention has

been given recently to demand management. This requires the assigning of priorities to water uses, and the subsequent fulfillment of only the most highly valued needs. In 1978 the U. S. National Water Commission directed that the most highly valued needs be determined through the concept of consumers' willingness to pay for publicly supplied water. This research is designed to test the use of a non-market valuation technique to assess the residential consumers' willingness to pay for household water. It was hypothesized that the willingness to pay would be dependent upon a consumer's income, family size, the amount of water used, the presence of a well, and also upon variables representing a consumer's beliefs and attitudes concerning local water scarcity and conservation. Results indicated that indeed most of these variables did play a role in the formulation of a willingness to pay for residential water. Some inconsistencies in results, however, indicate that more research is required before non-market valuation techniques can be applied with confidence to residential water demand analysis.
W81-05355

URBAN PROVISIONS OF THE MINNESOTA COST-SHARE PROGRAM,
Soil and Water Conservation Board, St. Paul, MN.
For primary bibliographic entry see Field 6E.
W81-05380

COSTS FOR MANAGING A CONSTRUCTION SITE RUNOFF CONTROL PROGRAM,
CH2M/Hill, Inc., Boise, ID.
M. L. Zimmerman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 259-266, 2 Tab.

Descriptors: *Water pollution control, *Urban runoff, *Construction, *Runoff, *Costs, Sediment control, Watershed management, Administrative agencies, Operating costs, Erosion control.

Because of the lack of cost data for administrative or management functions for construction site runoff pollution control programs, a survey was made of programs currently operating in the country. State, county and city officials involved with sediment and erosion control programs were interviewed, and adequate data for interpretation was obtained from 18 programs. The total number of plan reviewers plus site inspectors associated with an individual program ranged from 1 to 13. All but two of the programs shared their clerical staff with other departments, and most of the reviewers and inspectors spent only part of their time on the runoff control program. Inspections per construction project ranged from 2 to 10. About 90% of the program violations could be handled out of court by working with the developer. A unit cost of $85 to $150 per acre was estimated based on the survey data. This range in cost per acre can be used to estimate the cost for a proposed control program if the acres to be developed can be projected. (Moore-SRC)
W81-05381

GROUNDWATER DEPLETION, IN FEET, ALLOWED IN CENTRAL LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1980,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map LC-23, 1981. 1 Sheet.

Descriptors: *Maps, *Groundwater, *Water level, *Taxes, Irrigation water, Water loss, Groundwater depletion, *New Mexico, Central Lea County, Internal Revenue Service.

Map at the scale of 1/2-inch per mile shows areas in central Lea County, N. Mex., where values of water level, in feet, have been assigned for the year 1980. This map has been prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Lea County to calculate water-depletion losses for income tax purposes. (USGS)
W81-05399

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN NORTHERN LEA COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1980,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map LN-23, 1981. 1 Sheet.

Descriptors: *Maps, *Groundwater, *Water level, *Taxes, Irrigation water, Water loss, Groundwater depletion, *New Mexico, Lea County, Internal Revenue Service.

Map at the scale of 1/2-inch per mile shows areas in northern Lea County, N. Mex., where values of water level, in feet, have been assigned for the year 1980. This map has been prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Lea County to calculate water-depletion losses for income tax purposes. (USGS)
W81-05400

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN A PART OF CURRY COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1980,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map CU-21, 1981. 1 Sheet.

Descriptors: *Maps, *Groundwater, *Water level, *Taxes, Irrigation water, Water loss, Groundwater depletion, *New Mexico, Curry County, Internal Revenue Service.

Map at the scale of 1/2-inch per mile shows areas in Curry County, N. Mex., where values of water level, in feet, have been assigned for the year 1980. This map has been prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Curry County to calculate water-depletion losses for income tax purposes. (USGS)
W81-05410

GROUND-WATER DEPLETION, IN FEET, ALLOWED IN PORTALES VALLEY, ROOSEVELT COUNTY, NEW MEXICO, BY U.S. INTERNAL REVENUE SERVICE FOR CALENDAR YEAR 1980,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. D. Hudson.
New Mexico State Engineer Map RO-24, 1981. 1 Sheet.

Descriptors: *Maps, *Groundwater, *Water level, *Taxes, Irrigation water, Water loss, Groundwater depletion, *New Mexico, Roosevelt County, Internal Revenue Service.

Map at the scale of 1/2-inch per mile shows areas in Roosevelt County, N. Mex., where values of water level, in feet, have been assigned for the year 1980. This map has been prepared cooperatively by the New Mexico State Engineer and the U.S. Geological Survey. It is a guideline map, approved by the U.S. Internal Revenue Service, to be used by landowners in irrigated areas of Roosevelt County to calculate water-depletion losses for income tax purposes. (USGS)
W81-05411

CASE STUDIES IN THE DEVELOPMENT OF NEW MEXICO WATER RESOURCES INSTITUTIONS: THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT AND URBAN WATER PRICING,
New Mexico Water Resources Research Inst., Las Cruces.
M. B. McDonald, J. Tysseling, M. Browde, and L. Brown.
Report No 131, January, 1981. 136 p, 1 Fig, 24 Tab, 6 Ref.

Descriptors: *Water resources development, *Metropolitan water management, *Institutional constraints, *Water supply, *Economic aspects, Urban sociology, Irrigation, Water demand, Water rates, Water consumption, Water conservation, Urban planning, Case studies, *New Mexico.

In recent years there has been growing recognition that the water situation in the arid Southwest must be examined within a broad context that involves the social aspects, not just the strict physical parameters of the problem. More and more it is being realized that the sometimes restricted water supply in a specific area is an institutional, manmade constraint rather than a hydrological one. The Middle Rio Grande Conservancy District (MRGCD) is the single sustaining institution for irrigated agriculture in this area, amid surging urban development. The history and current issues of the MRGCD are described and the water pricing policy of four New Mexico cities is analyzed: Santa Fe, Albuquerque, Belen, and Los Lunas. Included are a history of water rates and water-rate structures, as well as the social and economic conditions that have influenced these rates. Both Albuquerque and Santa Fe have experienced significant changes in urban water pricing, most often because of more efficient water use and conservation. On the other hand, this has not been the case at either Belen or Los Lunas, where social and economic forces of change are not of the same degree or magnitude as in Santa Fe and Albuquerque. Urban water pricing is a water-management institution in that rate structures allocate city water among various customers, encourage social values, and influence attitudes. (Garrison-Omniplan)
W81-05436

A PRELIMINARY STUDY ON EXPANDING AND FINANCING STATE WATER DEVELOPMENT,
Utah Water Research Lab., Logan.
D. H. Hoggan, K. R. Kimball, and J. M. Bagley.
Water Resources Planning Series UWRL/P-80/07, December, 1980. 43 p, 10 Tab, 21 Ref, 1 Append.

Descriptors: *Water resources development, *Financial feasibility, *Resources management, *Project planning, *Water development, Benefits, Water supply development, Economic aspects, Government supports, Grants, Feasibility studies, Public investment, Bond issues, *Utah.

Agriculture has always been a major industry in Utah and still accounts for the greatest single consumptive use of water; however, industrial and military growth, urbanization, and the utilization of Utah's abundant outdoor recreational resources have gained significantly in relative prominence. An emerging trend in federal policy has been to shift a larger share of water development costs to individual states and localities with the aim of reducing federal investment in uneconomic water development projects. Traditional state projects have been small, single purpose, and relatively inexpensive, but emerging projects are tending to be more expensive, larger, and focused on developing water for municipal, agricultural, and energy-related industrial purposes. This report examines economic indicators and evaluates potential projects in light of impacts from recent energy price increases, domestic inflation rates, financial market fluctuations, and changing public attitudes regarding federally sponsored water resource development and management. It concludes that greater clarity is needed in legislative mandates for water development projects to avoid excessive and premature investment of public funds on projects whose feasibility is not completely proven. Growth projections indicate overall demand, but

do not provide sufficient detail. (Garrison-Omniplan)
W81-05445

ENERGY CONSERVATION OPPORTUNITIES IN MUNICIPAL WATER AND WASTEWATER SYSTEMS,
Ayres, Lewis, Norris, and May, Inc., Ann Arbor, MI.
D. W. Lystra, A. K. Singhal, and P. N. Loud.
Journal of the American Water Works Association, Vol 73, No 4, p 170-177, April, 1981. 3 Fig, 10 Tab, 4 Ref.

Descriptors: *Energy conservation, *Municipal water, *Municipal wastewater, Water treatment, Wastewater treatment, Michigan, Cost analysis, Economic aspects, Energy, Electric power, Natural gas, Fuel.

A national survey has shown that water and wastewater systems are the largest single energy consumers in local governments. In addition, direct energy costs of water and wastewater systems account for fully 20 percent of their total operating budgets. The Michigan Department of Commerce sponsored a study in 1979 to identify energy conservation opportunities in existing water and wastewater facilities. Energy audits conducted at two municipal water systems and at two municipal wastewater systems examined the treatment systems; capacity control systems; heating, ventilation, and air conditioning systems; and electrical systems for opportunities to conserve energy. The audits were designed to identify changes in operational and maintenance strategies, equipment changes, design changes, and relaxation or modification of design standards which would result in reduced energy consumption. The municipal water and wastewater systems in Michigan were found to rely almost entirely on electricity and natural gas for their energy requirements. Electricity for pumping was the major component of energy consumption in water systems, while electricity for aeration blower drives and natural gas for sludge heating and incineration were the biggest consumers in wastewater systems. A total of 93 opportunities for energy conservation were identified in the four systems. Implementation of these changes would result in a 14.3 percent reduction in total electrical consumption and a 58 percent reduction in natural gas consumption, for a total energy cost savings of about $335,000 annually. About 16 percent of these savings could be achieved through operational and maintenance changes costing less than $500 and having an average simple payback period of less than one month. An additional 6 percent of the potential savings could be achieved through changes costing between $500 and $2,000 to implement, with simple payback achieved in slightly over a year. (Carroll-FRC)
W81-05614

CHARGING HOUSEHOLDS FOR WATER,
S. Lucas.
Water, No 35, p 24-25, November, 1980.

Descriptors: *Great Britain, *User charges, *Domestic water, Municipal water, Water metering, Water use, Economic aspects, Water costs.

Household water charges in Great Britain have traditionally been determined by the rateable value of the property. However, there has been an increasing sense of unfairness regarding this rate-setting practice system. The British National Water Council has investigated possible alternative methods for charging for water services. Possibilities include maintenance of the status quo, which is relatively inexpensive to apply but which is unfair to some and does nothing to discourage waste; universal household metering, which is fair and discourages waste but is expensive to initiate and to maintain; adjustment of the present system to use a different basis, such as number of rooms or number of residents, for determination of the rates or to permit lower rates for households with only one resident; and provision of optional metering for households if they agree to meet the costs. The third option would be difficult and potentially expensive to administer. It could also be expected to lead to complaints from two-person households paying the same rates as those with many residents. Optional metering would slightly increase average household bills, and the costs of metering would probably equal or exceed the savings for most households. However, this option provides the most potential in terms of moving towards a more acceptable system, allowing time for further evaluation while providing some consumers with some relief. (Carroll-FRC)
W81-05689

6D. Water Demand

NON-MARKET VALUATION OF WATER IN RESIDENTIAL USES,
Florida Univ., Gainesville. Water Resources Center.
For primary bibliographic entry see Field 6C.
W81-05355

BUTTE VALLEY DIVISION, KLAMATH PROJECT, OREGON-CALIFORNIA.
Water and Power Resources Services, Sacramento, CA. Mid-Pacific Region.
Concluding Report, May, 1981. 64 p, 11 Fig, 1 Append.

Descriptors: *Water resources development, *Groundwater potential, *Water use, *Water supply development, Hydroelectric power, Diversion, Instream flow, Legal aspects, Aquifers, Anadromous fish, Pumpage, Butte Valley, *California.

A water supply for Butte Valley, California was investigated, together with a review of the overall water supply availability, need, and opportunity for development in the Upper Klamath Basin. Uncommitted water in the Upper Klamath River Basin is insufficient to divert Klamath River water to Butte Valley or elsewhere without aggravating the dry-year shortage in anadromous fish flows downstream from Iron Gate Reservoir. From a water rights standpoint, however, the Oregon-California Compact would give priority to such agricultural diversion over Iron Gate Fish requirements. Development of Long-Round Lakes does not appear justifiable as a power project, unless additional downstream power facilities are constructed. The Klamath River, because of environmental, political, and economic factors, does not offer a viable source of supply for Butte Valley. Near-term water supply needs for Butte Valley can best be met by increasing ground-water development. In the southern portion of the valley where well interference is a problem, the necessary supplemental water supply can be provided by deepening existing wells so that they penetrate the underlying lakebed deposits, or by drilling new wells penetrating the lower aquifer known as the High Cascade Volcanics. Estimates show that an additional 40,000 acre-feet of ground water can be pumped annually from Butte Valley without exceeding the safe ground-water supply. (Moore-SRC)
W81-05389

WATER RESOURCES OF UPPER SEPARATION CREEK BASIN, SOUTH-CENTRAL WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-05396

CASE STUDIES IN THE DEVELOPMENT OF NEW MEXICO WATER RESOURCES INSTITUTIONS: THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT AND URBAN WATER PRICING,
New Mexico Water Resources Research Inst., Las Cruces.
For primary bibliographic entry see Field 6C.
W81-05436

WATER DEMAND AT RECREATION DEVELOPMENTS,
Utah Water Research Lab., Logan.
S. Lam, and T. C. Hughes.
Water Resources Planning Series UWRL/P-80/06, December, 1980. 51 p, 30 Fig, 25 Tab, 17 Ref, 3 Append.

Descriptors: *Water demand, Multiobjective planning, *Recreation, *Public waters, *Seasonal variation, Recreation demand, Camping, Mountain lakes, Flood peak, Recreation facilities, State jurisdiction, Camp sites, *Utah.

Design criteria for drinking water systems at recreation developments, particularly summer homes, cause frequent confrontations with regulatory agencies as use changes from primarily weekends to more permanent residency, such as on a time-sharing basis. Historic water use data from eleven recreational sites in Utah and one in Wyoming were gathered, and additional daily and instantaneous measurements during peak seasons were analyzed. The water demand parameters included average, peak month, peak day, and instantaneous events at mountain cabins, resort condominiums, marinas, and recreation vehicle campgrounds. Both the seasonal average and the peak month demands were highest for Silver Fork, even though water use data only covered the winter season. Very low levels shown for Timber Lakes may be distorted by inadequate system pressures. Bridgerland Village and Pine Mountain appear best to represent flows expected at future cabin site water systems, where the peak season averages are 147 and 91 gpdu, respectively, long as one month, the water use at mountain cabin developments is not more than one-fourth that of an average municipality. There was higher use than expected at condominiums and recreation vehicle campgrounds. Better definition is needed for recreation developments to guide further study. The study indicates that some changes are also needed in state minimum design standards until the data base is improved. (Garrison-Omniplan)
W81-05441

A PRELIMINARY STUDY ON EXPANDING AND FINANCING STATE WATER DEVELOPMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6C.
W81-05445

MONTANA'S EXPERIENCE IN RESERVING YELLOWSTONE RIVER WATER FOR INSTREAM BENEFICIAL USES - THE RESERVATION DECISION,
Engineering and Research Center, Denver, OH.
For primary bibliographic entry see Field 6E.
W81-05537

IMPROVING THE QUALITY OF LIFE,
United Nations Development Program, New York.
For primary bibliographic entry see Field 6F.
W81-05686

WATER--RESOURCES AND ABSTRACTIONS,
Water, No 36, p 18-19, January, 1981. 3 Fig.

Descriptors: *Great Britain, *Rainfall, *Water use, Excess water, Precipitation, *Available water, Statistics, England, Whales.

Statistical information about water resources and abstractions in England and Whales is presented. Both rainfall and residual rainfall vary geographically and within a year and from year to year. The northern and western sections of the island receive more rainfall than other areas. Abstractions of water from surface and groundwater sources are controlled by licenses issued by the water authorities. Abstractions from groundwater sources constitute a higher proportion of total abstractions in the south and east regions, where aquifers are more extensive. Public water supplies grew steadily between 1974 and 1979 and use the largest proportion of the total abstractions. Abstractions by power stations have declined slightly, but still use almost as much water as public water supplies.

Industrial water use has decreased slightly, comprising about half the demand of public water supplies. Abstractions for agricultural use, while much smaller in total volume than other sectors, can have a significant effect on water resources due to a large local demand during periods in which water resources are likely to be under stress. (Carroll-FRC)
W81-05696

WATER RECREATION--A LOOK TO THE FUTURE,
National Anglers' Council (England).
P. Tombleson.
Water, No 37, p 7-9, March, 1981.

Descriptors: *Recreation facilities, *Water resources development, *Resources management, Recreation, Fishing, Sport fishing, Water management, *Great Britain, Economic aspects.

The British Water Act of 1973 specifies that water authorities shall have responsibility for the provision of recreation on their waters and associated land holdings. Of the 557 reservoirs at least two hectares in area owned or managed by water authorities or other water suppliers, some form of land or water recreation was supported at 523. Fishing was available at 330 reservoirs, followed by sailing at 90, SCUBA diving at 24, canoeing at 32, water skiing at six, and swimming on one. While 86 percent of the sailing reservoirs lease sailing rights to clubs and individuals, only 45 percent of the reservoirs used for fishing are leased. This is partly due to the fact that the water authorities are responsible for a fisheries function which entails maintenance, improvement, and development of fisheries. Only 0.4 percent of the net capital outlay of the British National Water Council was spent on recreation and amenity during 1979-1980. Revenue expenditures on recreation were also very small. General recreational policy could be adjusted by encouraging water authorities to lease their major recreational facilities to sportspersons, to increase subsidies on recreation and increase the availability of recreational facilities, or to run their water activities in partnership with the private sector. It is suggested that leasing of recreational facilities to sports clubs might produce a new wave of interest in water recreation and a wider range of facilities at cheaper prices. Problems with each of the options are discussed. (Carroll-FRC)
W81-05698

6E. Water Law and Institutions

THE ROLE OF REGULATION IN URBAN EROSION AND SEDIMENT CONTROL,
Illinois Inst. of Natural Resources, Chicago.
F. Beal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 43-49.

Descriptors: *Erosion control, *Sediment control, *Regulations, *Urban runoff, Cost-benefit analysis, Land use, Local governments, State jurisdiction.

In recent years the agencies responsible for protecting the environment have tackled the most obvious problems amenable to simple solutions, leaving the more complex problems. One such problem is urban erosion. Many of the solutions to erosion and sedimentation are well known and effective, but little implemented by those persons in the professions of land use. The cause is seen to be the conflict between the short-term self-interest of the farmer or developer and the long-term public interest of the community in protecting the resources. The consequences of erosion and runoff tend to be transferred from the landowner to other landowners or the public. Land-use regulations can be used to make the landowner carry the costs. Regulations may set standards to be met, or specify management or operating practices. The former are preferred as they allow for experimentation and innovation while achieving the goal of the regulation. Local regulations and enforcement are needed, backed up by statewide regulations. (Brambley-SRC)
W81-05358

URBAN EROSION,
Minnesota State Senate, St. Paul.
For primary bibliographic entry see Field 4D.
W81-05359

EROSION AND SEDIMENT CONTROL REGULATORY LAWS -- EVOLUTION AND CURRENT STATUS,
National Association of Conservation Districts, Washington, DC.
M. M. Garner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. 137-156 p, 12 Ref, 1 Append.

Descriptors: *Legislation, *Regulations, *Erosion control, *Sediment control, *Soil conservation, Nonpoint pollution sources, Water pollution sources, Water quality control, Urban areas.

The Soil Conservation Act of 1935 was the first act to address the problems of erosion and sediment losses of soil, and develop a program of soil and water conservation. This was followed by the Standard State Soil Conservation Districts Law in 1936 which initiated the formation of soil conservation districts by the states. Both laws allowed for regulatory controls but tended to rely on voluntary compliance. In the 1970's some 20 states responded to increasing erosion, sedimentation and nonpoint source pollution by enacting control legislation. Some of the laws were based on the Model State Act for Soil Erosion and Sediment Control developed by a task force from the affected government agencies. The primary purpose of the laws is the prevention and control of erosion and sediment damages and the improvement of water quality, but they are not uniform. The laws may or may not require or establish conservation plans, soil loss limits, conservations standards, requirements for permits, enforcement provisions, and cost sharing. They maintain both voluntary and regulatory aspects and recognize the need for cooperation of county and municipal governments, and the importance of erosion and sediments control in urban areas. (Brambley-SRC)
W81-05367

EROSION CONTROL IN A SUBURBANIZING AREA: THE CASE OF MIDDLETON, WISCONSIN,
Middleton City Planning Commission, Wisconsin.
D. Donoghue, W. Feist, and R. Lehmann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. 157-163 p, 2 Fig.

Descriptors: *Erosion control, *Ordinances, *Urbanization, *Sediment control, *Land use, Urban runoff, Vegetation, Costs, Suburban areas, Middleton, *Wisconsin.

The City of Middleton, Wisconsin, is a rapidly growing suburb of Madison, with over a mile of frontage on lake Mendota. Agricultural and urban construction erosion has caused serious sediment problems in the lake and in 1970 an ordinance was passed requiring land grading permits. By 1976 this ordinance was found to be inadequate and in 1979 a new ordinance was adopted. It addresses land disturbing activities or uses including tilling, removal of ground cover, grading, excavating and filling, occurring in the course of development or alterations in developed property. Agricultural land uses and home gardens are exempt. The three categories of application are those activities which require prior approval before work starts and close supervision thereafter, those activities requiring special controls on runoff, and all other activities. The standards are expressed in performance terms, subject to the following principles: the smallest practical area of land shall be exposed for as short a time as possible; temporary cover will be used if practicable; runoff will be accomdated; permanent, final plant cover or structures will be installed as soon as possible; the development plan will minimize runoff; and natural plant covering shall be retained and protected. Plans are reviewed by the city engineer, who is also responsible for enforcement. To date contractors have expressed willingness to comply and only minor reservations about additional costs. (Brambley-SRC)
W81-05368

DEVELOPMENT OF COMPREHENSIVE EROSION CONTROL AND STORMWATER MANAGEMENT ORDINANCES IN DANE COUNTY, WISCONSIN,
Minnesota State Water Planning Board, St. Paul.
F. B. Richardson, and D. E. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. 165-175 p, 5 Ref.

Descriptors: *Ordinances, *Erosion control, *Sediment control, *Land use, *Storm runoff, *Construction, Water pollution prevention, Administration, Sediment yield, Dane County, *Wisconsin.

Nutrient and sediment loads to the Madison lakes have been sufficiently large as to cause eutrophication and require dredging. A survey of construction sites in Dane County was conducted to determine the potential sediment yield from construction sites and delivery by urban stormwater. Of the 68 sites, 20 were large (10 acres), 15 were medium-sized (2-10 acres), and 33 were small (2 acres). Inattention to erosion control practices was extensive, crossing all stages of construction, units of government, and sizes of projects. Small and medium-sized projects exhibited a total absence of erosion control practices. Many observed erosion control practices were inadequately applied. The governmental units which have enacted erosion control ordinances are not effectively controlling erosion. These four problems and the administrative problems leading to them led to the development of a model ordinance, since existing ordinances were inadequate. The model ordinance seeks to regulate erosion-sedimentation from general nonagricultural land disturbing uses and to control runoff on lands larger than a given minimum area through a permit system, with control achieved by the setting of performance standards. The model suggests threshold values for land area or soil volume to which the model ordinance applies; these may be changed by the government unit adopting the ordinance. (Brambley-SRC)
W81-05369

THE DEVELOPMENT OF EROSION AND SEDIMENT CONTROL ORDINANCES IN THE CINCINNATI AREA,
Soil Conservation Service, Cincinatti, OH.
For primary bibliographic entry see Field 4D.
W81-05370

NON-AGRICULTURAL EROSION CONTROL IN IOWA,
Iowa Dept. of Soil Conservation, Des Moines.
L. G. Vance.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environ-

mental Protection Agency Report EPA-905/9-80-002, January, 1980. p 209-214.

Descriptors: *Soil erosion, *Erosion control, *Construction, *Sediment control, Erosion rates, Legislation, Soil types, Highway effects, *Iowa.

On July 1, 1971, a legislative bill entitled 'An Act Related to Conservation of Soil and Water Resources of the State' became law in Iowa. The bill granted soil conservation districts the authority and responsibility to establish soil loss limit regulations. Soil loss limits are required for agricultural land and for construction sites. To insure that uniform and reasonable regulations were established, a technical committee developed a guideline document that set forth annual maximum permissible soil loss rates for the 1,500 soil types classified in Iowa. These range from two to five tons per acre per year and are coincident with the replenishment rate of individual soil types. For construction sites, a uniform five tons per acre per year maximum permissible rate was suggested. Regulations provide that an owner or occupant of land damaged by another landowner's sediment may file a complaint with the soil conservation district commissioners. Since initiation of the law in 1972, approximately 550 complaints have been filed. All but 63 were settled voluntarily. Fourteen complaints were in non-agricultural areas; three against highway site erosion and 11 against development areas. Eight of the non-agricultural complaints required administrative orders before they were resolved. (Moore-SRC)
W81-05374

INSTITUTIONAL ANALYSIS OF LOCAL ORDINANCES ADOPTION,
Wisconsin Univ.-Madison.
W. L. Church.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 215-216.

Descriptors: *Legal aspects, *Water conservation, *Water pollution, Soil conservation, Jurisdiction, Zoning, Legislation, Local governments, *Wisconsin.

In Wisconsin, under Chapter 92 of the Statutes and other laws, there are three great impediments to attempts by local government to deal with the problems of soil and water conservation and pollution: these include substantive narrowness, geographical constraints and procedural obstacles. There is a proliferation of state statutes in Wisconsin authorizing efforts to cope with water pollution. The internal ambiguities of Chapter 92 are made worse because there are so many other substantive aspects of the same over-all pollution problems that are dealt with in other statutes such as sanitation, health, solid waste, zoning, shoreland zoning, building, subdivision, and farmland preservation statutes. The problem of overlapping and competing substantive missions is compounded locally because there is no one entity with full authority to act throughout a really useful local geographic area. In order for a comprehensive approach to water pollution to be undertaken, voluntary cooperation is required not only of many sometimes jealously competitive agencies, state and local, but also of many separate municipalities, towns, counties, regional authorities and state agencies. In addition to the problems imposed by the organization of governmental institutions, the statutes often raise procedural obstacles to progress. Chapter 92 currently, for example, requires a referendum among voters who may be affected by a regulatory ordinance, before such ordinance can be enacted. (Moore-SRC)
W81-05375

CONSIDERATIONS FOR THE DEVELOPMENT OF URBAN EROSION CONTROL ORDINANCES,
North Carolina Department of Natural Resources and Community Development, Raleigh. Div. of Land Resources.
H. K. Britt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conferences on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 247-251.

Descriptors: *Erosion control, *Urban runoff, *Construction, *Legal aspects, Soil erosion, Education, Public participation, Cost-benefit analysis, Ordinances, *North Carolina.

North Carolina has had a statewide erosion control ordinance since 1973. This program has jurisdiction over all land disturbing activities except agricultural and forestry activities and those activities governed by the North Carolina Mining laws. The State's general statute provides for local units of government to adopt and administer their own erosion control ordinances. The local ordinances must meet minimum state requirements and may include more stringent standards, based upon local needs. To develop an urban erosion control program, first a community must evaluate the real cost and benefits of such a program including any spin-offs. A long and deliberate effort should be made to bring all interested parties into the development process from the beginning. Once the program is developed an educational effort should be directed to all affected parties and to the general public. The ordinance should fit into other existing programs, be fairly and justly enforced with standards that allow for flexibility. It should utilize every available existing source of manpower and expertise and have enforcement mechanism which can be swiftly and fairly exercised by the staff. The goal of any successful program should be one that will provide for the maximum amount of protection for our waterways and natural resources, and still allow for the progress of a community to continue. (Moore-SRC)
W81-05379

URBAN PROVISIONS OF THE MINNESOTA COST-SHARE PROGRAM,
Soil and Water Conservation Board, St. Paul, MN.
G. Larson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 253-257.

Descriptors: *Urban runoff, *Erosion control, *Water quality control, *Sediment control, Legislation, Cost sharing, Soil erosion, Economic aspects, *Minnesota.

When the 1977 Minnesota Legislature provided the Soil and Water Conservation Board with three million dollars to develop and implement a comprehensive soil and water conservation cost-share program, a long standing tradition was broken. Urban, non-agricultural land, and property owned by non-agricultural procedures had generally not been eligible for cost-share assistance. Estimates from 1975 place the Minnesota urban acreage at 1,260,000 acres or 2.3%, and non-agricultural at 27,283,000 acres or 55.9%. Located on this acreage are many severe erosion, sedimentation and related water quality problems. The jurisdiction of Soil and Water Conservation Districts over all the land in the state certainly ranks as one of the most significant features of the urban and nonagricultural provisions of this program. Others include construing land occupier as a broadly defined participant, the wording of the purpose and applicability of eligible control measures, and the emphasis on water quality. Nine Districts have encumbered approximately $75,000 for non-agricultural and urban projects. Most of those approved have been municipalities and units of government, others include corporations and private landowners. (Moore-SRC)
W81-05380

THE NEW JERSEY EXPERIENCE IN CONTROL OF URBAN SOIL EROSION AND SEDIMENTATION,
New Jersey Dept. of Agriculture, Trenton. Soil and Water Conservation Service.
S. R. Race.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 327-334.

Descriptors: *Urban runoff, *Erosion control, *Sediment control, *Construction, Soil erosion, Storm runoff, Legislation, Urbanization, *New Jersey.

With over 1,000 persons per square mile in New Jersey, the pressures of development and urbanization are intense. These development pressures have been recognized as the cause of a severe soil erosion and sedimentation problem. Urban soil erosion and sediment control legislation was enacted by the state legislature in 1975. The key regulation in the law is that no municipality may grant approval of an application for development for any project until a plan for soil erosion and sediment control has been certified by the soil conservation district. Enforcement provisions include the issuance of stop-construction orders if a project is not being executed in accordance with the certified control plan. From January 1, 1976 to June 30, 1979, 6,387 applications have been received, involving approximately 64,000 acres of land to be developed. Of these, 221 projects were rejected. Most developers have accepted the erosion requirement and include control plans without coercion. The home rule option was exercised by 85 municipalities which adopted ordinances meeting the approval of the State Committee. This law may be the most comprehensive in that it exempts only single family homes and disturbances of less than 5,000 square feet. (Moore-SRC)
W81-05387

GEORGIA'S APPROACH TO URBAN EROSION AND SEDIMENT CONTROL,
Georgia Soil and Water Conservation Committee, Athens.
K. Obenauf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197965, Price codes: A16 in paper copy, A01 in microfiche. In: National Conference on Urban Erosion and Sediment Control: Institutions and Technology, October 10-12, 1979, St. Paul, Minnesota. Environmental Protection Agency Report EPA-905/9-80-002, January, 1980. p 335-344, 2 Fig.

Descriptors: *Erosion control, *Urban runoff, *Sediment control, *Construction, Legislation, Ordinances, Inspection, Industrial plants, *Georgia.

Georgia's Erosion and Sedimentation Act became effective April 24, 1975. Its intent is the control of major urban sediment producers, that is, large construction such as shopping centers, subdivisions and industrial sites. Local units of government are given two options. They can adopt comprehensive programs for erosion and sediment control, or allow permitting and enforcement responsibilities to be handled by the state's Environmental Protection Division. Soil and Water Conservation Districts review all plans for erosion and sediment control. The State Soil and Water Conservation Committee initiated a comprehensive program to assist Georgia citizens with requirements of this relatively new law. Such a program includes printed articles, seminars, a model ordinance, pamphlets and a manual containing engineering standards and specifications. The most common statewide problem is failure to maintain on-site control structures. This can generally be traced to insufficient inspection programs. The most successful permitting pro-

grams seem to be based on a strong inspection department. Other successful means of assuming compliance with permit requirements are 'stop work' order and posting performance bonds. (Moore-SRC)
W81-05388

AREAWIDE WATER SYSTEM PLANNING IN WASHINGTON STATE,
Washington State Dept. of Social and Health Services, Olympia.
R. Siffert.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No EE1, p 241-249, February, 1981.

Descriptors: *Water law, *Water supply systems, *Regional planning, Water quality, Public health, Wells, Management planning, Washington.

The provisions of the Public Water System Coordination Act (PWSCA), its procedures, and the basic concepts embodied in the Washington State law are described. The law was passed to encourage planning and consistency in water system development. Teamwork and local responsibility are used to achieve the coordinated development of water utilities within a given area. Water system development is also integrated into land use planning of an area. The first step in the process is an evaluation of water systems and their problems. A Water Supply Service Area is defined, and a plan for development is established. A case history of implementation of the PWSCA in the Burbank area of Walla Walla County is presented. Many of the wells in this area were high in nitrates, and the development plan called for intertying the existing systems, possibly drilling new wells, and developing more storage capacity as growth occurred. Phase 2 in Walla Walla consisted of a geological study to analyze the groundwater situation, a feasibility study to assess the cost to each existing water system which might become part of a regional system, and necessary institutional arrangements. (Small-FRC)
W81-05526

MONTANA'S EXPERIENCE IN RESERVING *YELLOWSTONE RIVER WATER FOR IN-*STREAM BENEFICIAL USES - THE RESERVATION DECISION,
Engineering and Research Center, Denver, OH.
J. L. Thomas, and K. Klarich.
Water Resources Bulletin, Vol 17, No 2, p 255-261, April, 1981. 2 Fig, 1 Tab, 14 Ref.

Descriptors: *Water use, *Legal aspects, Planning, Water resources development, *Montana, *Yellowstone River, River basins, Drainage, Water demand, Water conservation, Water control, Reservation doctrine.

Steps were undertaken in the early 1970's by the State of Montana to protect existing users of the state's water and to control future uses to which the water could be put. These steps were taken as a result of mushrooming energy development in the Yellowstone River drainage basin with its attendant demands for large volumes of water. In 1973 a Water Use Act was passed and a moratorium was placed on the granting of new permits for major diversion. Various government agencies were given the opportunity to request to reserve water for future beneficial uses, among these being instream purposes. The state agency in charge of the reservation of water has reviewed the reservation requests, and its final decision in this regard was announced in December of 1978. The decisions of that agency are reviewed here, with the general outcome being seen as an attempt to preserve the integrity of the stream while also strengthening its agricultural uses. A portion of the flow was not earmarked, which will provide some flexibility in reacting to future demands. It is assumed that future legislative activity in Montana will focus attention on these reservations, and that Montana itself will have to review the grants every ten years to ensure that the objectives of the reservations are being met. Thus adjustments of instream flows and other reserves are expected from time to time. (Baker-FRC)
W81-05537

LAS VEGAS BETS ON A SURE WINNER,
For primary bibliographic entry see Field 5D.
W81-05567

CHRIS BECK: WATER POLLUTION CONTROL IN THE 1980'S.
Journal of the Water Pollution Control Federation, Vol 52, No 2, p 222-228, February, 1980.

Descriptors: *Water pollution control, *Regulations, *Water quality, *Governmental interrelations, Planning, Safe Drinking Water Act, Groundwater, Waste water treatment, Industrial wastes, Disposal, Clean Water Act, Legal aspects, Water law, Water policy, Local governments.

An interview with Eckardt Beck, appointed as assistant administrator for Water and Waste Management at the U.S. EPA in December, 1979, discloses his views on water pollution control in the coming decade. Mr. Beck suggests more attention to groundwater protection, coordination of statutory authorities, more community choice in sludge disposal options, a coordinated effort to control groundwater pollution involving governments at all levels and the general public, continued partnership with states under the construction grants program and expansion of this program to all states which wish to participate, development of recommendations on industrial cost recovery, attention to user charges so that municipalities have funds on hand for replacing and updating plants, allocation of pollutant loads from each source to maintain water quality standards, and improved data for non-point management. (Cassar-FRC)
W81-05569

RIGHTS AND LIABILITIES OF WATER SUPPLIERS ARISING FROM GROUNDWATER POLLUTION,
E. I. Selig.
Journal of the American Water Works Association, Vol 73, No 4, p 186-187, April, 1981. 2 Ref.

Descriptors: *Groundwater pollution, *Legal aspects, *Water suppliers, Liability, Judicial decisions, Negligence, Municipal water.

As a result of their status as public utilities and as monopolies on which the public must rely for a prime necessity of life, water suppliers are subject to an exceptionally high standard of public concern. The ruling in 1975 on the Moody v. City of Galveston case is used to illustrate recent trends in current law relevant to products liability, particularly by water suppliers. One trend is that the water supplier may be subject to the rule of strict liability for all resulting injuries to users, even when the contamination is not the result of the supplier's negligence. A second trend is refusal to permit the municipal or other public supplier to plead sovereign immunity as a bar to suit when the supplier is acting in a proprietary role. There is a possibility of large damage awards against water companies in cases in which a plaintiff claims serious injury resulting from the pollutants in the water supply, especially if the supplier has failed to use advanced water testing and treatment technologies. Preventive strategies which water suppliers should institute include periodic testing for any priority toxic pollutants known to exist or likely to exist in the watershed of the wells, treatment to remove priority pollutants, studies of the history and current pattern of waste disposal practices in the watershed areas, studies of groundwater flow patterns of aquifers feeding the wells, technical activities to divert wastes from aquifers, and legal and political activities to prevent or restrict waste disposal activities in the recharge zones on which the supplier relies. Suits by water suppliers against groundwater polluters can be expected to increase over the next several years. (Carroll-FRC)
W81-05612

NEW MEXICO STATE ENGINEER ISSUES ORDERS ON MINE DEWATERING,
K. P. Watson.
Natural Resources Journal, Vol 20, No 2, p 359-362, April, 1980. 28 Ref.

Descriptors: *Legal aspects, *Mines, *Dewatering, Uranium, *New Mexico, Jurisdiction, State jurisdiction.

The present case centers around the New Mexico water law which gives the State Engineer the jurisdiction over withdrawal of water from underground basins for mine dewatering and subsequent beneficial use. This withdrawal does not impair others' water rights if water level declines at senior appropriators' wells do not exceed 400 feet. The specific case of Phillips Uranium Corporation applying to the State Engineer to appropriate from the San Juan Underground Basin a total of 653,431 acre-feet of water over a 32.5 yr period is presented. By ordering the approval of the application, the State Engineer caused the first determination of the hydrologic characteristics of the particular aquifer to be made, whose location in the area of extensive energy reserves makes it a key to development of those resources. The order is the result of economic balancing between reasonable economic development of the area's uranium reserves and protection of prior water appropriators. (Baker-FRC)
W81-05622

IMPROVING THE DEVELOPMENT OF WATER QUALITY STANDARDS,
R. R. Noss, and D. H. Marks.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 426-429, April, 1981. 3 Fig, 5 Ref.

Descriptors: *Water quality standards, Standards, Water quality, *Water quality control, Quality control, Decision making, Administrative decisions, Legal aspects, Legislation, *Water pollution control.

An attempt was made to clarify the true nature of water quality standards by describing the process by which they are developed. Prior to the passage of the Federal Water Pollution Control Act Amendments of 1972, water pollution control activities in the US were based almost entirely on the achievement of instream water quality standards. The amendments added requirements that all point-source discharges install minimum levels of treatment by specific dates. Recently there has been increasing pressure to relax some of the minimum treatment requirements and depend more heavily on case-by-case analyses based on the instream water quality standards. As increasing demands are imposed on the same finite amount of water, the need for a systematic balancing of the conflicts in the development of water quality standards increases. As the costs of controlling pollution rise, the development of non-traditional water quality standards that are less expensive to meet will require more investment in and understanding of the process by which standards are set. Problems will require increasingly greater consideration of multiple objectives. A systematic process for setting water quality standards must be found that utilizes extensive information on alternatives and impacts and is capable of identifying and resolving conflicts among multiple objectives. (Baker-FRC)
W81-05623

NO MORE GRANTS, BETTER WATER QUALITY MEASURES, NO NATIONAL NON-POINT-SOURCE PROGRAMS NOW,
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 430-433, April, 1981.

Descriptors: *Water pollution control, *Government finance, Environmental protection, Economic aspects, Government supports, Evaluation, Water quality standards.

A position paper was drafted by the executive committee of the Water Pollution Control Federation concerning funding national water pollution control programs. Upon examining the Clean

Water Act's construction grants program, it was determined that about $106 billion will be needed to meet all of the municipal water pollution problems still existing. The current grants program cannot meet all of these needs. For various reasons the processes required for securing grant funding are extremely slow moving. At present it takes seven to 11 years to build a treatment plant. With these problems in mind, the goal of fishable, swimable water by 1983 and elimination of all pollutant discharges by 1985 cannot be achieved. Local governments must decrease their dependence on federal and state construction grants. Congress must provide maximum flexibility to local governments. Goals and deadlines must be re-set. The EPA must liberalize the definition of secondary treatment. Construction grants should be streamlined and project management duties transferred to the states. (Baker-FRC)
W81-05624

IMPROVING WATER QUALITY CRITERIA AND STANDARDS.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 434-439, April, 1981.

Descriptors: *Water quality standards, Standards, Water quality, Water quality control, Quality control, Decision making, Administrative decisions, Legal aspects, Government supports, *Water pollution control.

A position paper was drafted by the executive committee of the Water Pollution Control Federation concerning the improvement of water quality criteria and standards. The paper states that as concepts, water quality criteria and standards need a great deal of refinement. The procedures in which they are used also need revamping. Sampling, monitoring, standard-setting, and permit programs should be reconsidered together so as to demonstrate conclusively where progress is being made. One of the top priorities of EPA and of the state water pollution control agencies should be the integration of criteria and standards with the national permit program. It is recommended that the EPA promote positive ways in which realistic standards can be encouraged. If the EPA disapproves of some of the standards set by the states, this disapproval should carry with it definite recommendations, including specific technical and socioeconomic justifications, rather than making reference to the Red Book criteria or the unenforceable goals of the Clean Water Act. It is suggested that standards do not have to be changed as often as criteria may have to be updated. It is also recommended that, if the water quality desired cannot be attained through a combination of effluent treatment and best management practices for non-point sources, additional controls may be needed. (Baker-FRC)
W81-05625

CONTROLLING RURAL NON-POINT-SOURCE POLLUTION.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 440-443, April, 1981. 1 Fig.

Descriptors: *Nonpoint pollution sources, *Rural areas, *Water pollution control, Costs, Economic aspects, Governmental interrelations, Interagency cooperation, Political aspects.

A position paper was drafted by the executive committee of the Water Pollution Control Federation concerning the controlling of rural non-point-source pollution. According to this paper, national goals must be tailored to meet local situations, recognition must be made and variances allowed for the diverse spectrum of non-point source (NPS) pollutants, and increased study must be made into the interrelationships surrounding NPS pollutants. It is recommended that the Federal Water Pollution Control Act goal of zero pollution discharge be clarified. Secondly, fishable/swimmable water qualities need further definition. Third, the relationship between a best management practice (BMP) and the attainment of water quality goals is not yet well established. It is also recommended that the national program for control of NPS determine precisely the contribution of NPS pollutants to the attainment of water quality goals, establish the effectiveness of various control practices, and establish a cost/benefit ratio for various control practices. Also, better opportunities should be provided for communication between professionals involved in soil/water resource management. National and state programs are needed for the acquisition, storage, and disposition of information on soil salinity monitoring, irrigation water quality monitoring, sediment transport/deposition, and sediment/rainfall quality. (Baker-FRC)
W81-05626

WATER POLLUTION CONTROL BY AGREEMENT: THE FRENCH SYSTEM OF CONTRACTS.
Ottawa Univ. (Ontario).
P. Harrsion, and W. R. D. Sewell.
Natural Resources Journal, Vol 20, No 4, p 765-786, October, 1980. 6 Fig, 5 Tab, 45 Ref.

Descriptors: *Water pollution control, *Legal aspects, *France, Europe, Waste discharge, Industrial wastes, Economic aspects, Water quality management, Contracts, *Pollution taxes.

France instituted new approaches to water management in the 1960's in order to remedy the problems of disposal of massive quantities of effluents to relatively small river systems. Two major strategies for water pollution control were the adoption of a system of effluent discharge fees and a policy of voluntary agreements between the French government and major polluters. Available mechanisms for water pollution abatement involve such costs as setting up administrative systems, defining standards and fee levels, and implementing and enforcing costs. In France, autonomous river basin agencies develop water plans for their respective areas and implement a complex system of water charges. Waste discharge charges are applied differentially to industrial and domestic water users, but are not currently levied on the agricultural sector. Industrial pollution charges are levied on four types of pollutants: suspended matter, oxidizable matter, dissolved salts, and toxic matter. Adjustments to the basic charges are made in response to a variety of factors, such as pollution control measures and location. Since 1972, the French government has developed a series of voluntary contract agreements aimed at reducing specific problems of water quality. Most of the important contract agreements have been with particular industrial sectors. Under contracts between a particular industry and the central objectives by a certain date in return for lower pollution payments to river basin agencies and eligibility for pollution control equipment grants and loans. (Carroll-FRC)
W81-05630

SINKING FORTUNES: TEXAS REMEDIES FOR VICTIMS OF LAND SUBSIDENCE,
J. Reuter.
Natural Resources Journal, Vol 20, No 2, p 375-386, April, 1980. 74 Ref.

Descriptors: *Legal aspects, *Groundwater depletion, Subsidence, Liability, Groundwater recession, Groundwater budget, Groundwater availability, Water rights, Riparian rights, *Land subsidence, *Bayport, Texas.

Plantiff Smith-Southwest Industries and owners of neighboring commercial and residential property brought a class action suit against Friendswood Development Corporation and its parent Exxon Corporation, seeking damages for subsidence of their lands, located along the west bank of Galveston Bay. Friendswood had pumped groundwater from their own nearby inland property and sold it to occupants of their industrial park in Bayport, Texas. Land owned by the plantiff had dropped from seven feet above mean sea level in 1964, to be either submerged or periodically flooded by the sea by 1974. This was the first case to present the Texas Supreme Court with the issue of whether and when liability should be imposed for adjacent land subsidence caused by groundwater withdrawals. The case was decided on the basis of groundwater ownership rules alone rather than as a conflict between different surface and water rights. The majority decision does permit some compensation for subsidence grievances, but did not recognize a resort to subjacent support by groundwater. A possible action in negligence has now constrained the previously unlimited right to groundwater in Texas. The Texas legislature is developing rules to prevent waste and subsidence. (Baker-FRC)
W81-05631

LEGISLATION AND LAND DRAINAGE,
Water, No 36, p 42-44, January, 1981.

Descriptors: *Land reclamation, *Drainage, *Legal aspects, *Great Britain, Legislation, Riparian rights, Government interrelations, Planning.

The British Land Act of 1976 consolidated the provisions of many statutes dealing with various aspects of land drainage, repealing, in whole or in part, 25 other Acts. Although responsibility for the drainage of land rests primarily with the riparian landowner, water authorities have a responsibility for general supervision of all matters relating to land drainage in their areas. These water authorities exercise their land drainage functions through statutory regional land drainage committees, which may in turn work through local land drainage committees, permitting a fair degree of local control over budgeting and decision-making. Internal drainage boards are created to deal with specific large-scale problems in identifiable areas. Water authorities are responsible for maintaining and improving water courses which are designated 'main river' and are not empowered to perform work on other water courses except on a recoverable basis. However, the extent of 'main river' in practice is determined, and may be varied, by the respective water authority. Although it is often suggested that water authorities should assume full control over all water courses, this opens many questions regarding the definition of a water course, whether the water authority's powers would be mandatory or permissive, and the extent of local input, to which there are not at present satisfactory answers. The current complex system of responsibilities embodies the historically developed principle of local control of local matters. The real problem in land drainage management is not so much one of assigning responsibilities as lack of financial resources and commitments. (Carroll-FRC)
W81-05685

POLLUTION CONTROL--SWEDISH STYLE,
Keele Univ. (England).
J. J. Richardson.
Water, No 34, p 13-16, September, 1980. 1 Fig, 1 Tab.

Descriptors: *Water pollution control, *Sweden, *Regulations, Legal aspects, Federal jurisdiction, Water pollution sources, Permits, Licenses.

The Swedish Environmental Protection Act, passed in 1969, reduced the number of agencies involved in pollution control and instituted an apparently unified and integrated system. Private and public organizations may apply to the National Environmental Protection Board (NEPB) for a pollution exemption or to the Franchise Board (FB) for a pollution permit. The permit provides detailed specification of the nature of the polluting activity and the type of control and monitoring measures which are to be instituted. The exemption, which can be withdrawn at any time, also specifies the pollution control and monitoring measures which are to be taken if the polluting activity is to be allowed. Applications for permits or exemptions are announced publicliy, and opportunities are made for public response. The enforcement of pollution control however, is the responsibility of county administrations rather than of the central agencies. Although industrialists initially found it relatively easy to reach agreement with the NEPB on pollution cases, they are now more inclined to seek permits from the FB. While the NEPB acts more as a consensus agency with an emphasis on pollution control, the FB acts more as a conflict resolving agency. A major weakness in the enforcement system is that the organizations responsible for enforcement of pollution control

are also engaged in attempts to attract industries to their locales. The lack of qualified staff at the local level also hinders the enforcement effort. It is suggested that integration of enforcement duties into the NEPB structure would increase the expertise available to local and regional personnel and also increase the awareness on the part of the NEPB staff of the realities of specific industries. (Carroll-FRC)
W81-05691

EEC ENVIRONMENTAL POLICY: INVOLVING THE UK WATER INDUSTRY,
Water Research Centre, Stevenage (England).
P. Newman, and C. Maidment.
Water, No 36, p 29-31, January, 1981. 8 Ref.

Descriptors: *Environmental policy, *Europe, *Great Britain, Public policy, International agreements, Water policy, Water pollution, Water management, European Economic Community.

The European Economic Community (EEC) first announced an environmental policy agreement in 1972. This policy was designed to stimulate improvement of the setting and quality of life and the surroundings and quality of living conditions of persons residing in member countries. Although the British Government has responded to proposals for EEC legislation after they have been drafted, it has not been sufficiently involved in the drafting of proposals affecting the British water industry. The EEC Commission has established a series of action programs on the environment and has provided funds for research and development in the field of the environment. Under the action programs, EEC legislation has been introduced to reduce pollution and to improve the environment. In seven years, the Community adopted 58 legislative texts, 15 of which were specifically on water pollution. The 13 EEC directives (binding on member nations) which have special importance for the water industry are concerned with the protection and improvement of the aquatic environment and/or with water quality. Environmental research programs sponsored by the Commission have concentrated on establishment of criteria for pollutants, environmental information management, reduction and prevention of pollution, and protection and improvements of the natural environment. The British water industry should become more involved in the current research program and should study the results of earlier research programs in order to be in a better position to influence future legislation during the drafting stages. (Carroll-FRC)
W81-05695

6F. Nonstructural Alternatives

EROSION AND RUNOFF CONTROL IN NORTHWESTERN COLORADO,
Northwest Colorado Council of Governments, Frisco.
For primary bibliographic entry see Field 4D.
W81-05384

UN WATER CONFERENCE: SCOPE FOR TRANSFER OF KNOWLEDGE IN ITS ACTION PLAN,
United Nations, New York. Dept. of International Economic and Social Affairs.
H. M. Neghassi.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 351-363, March, 1980. 2 Tab, 11 Ref.

Descriptors: *Water resources development, *Organizations, *Research priorities, *International agreements, *Multiobjective planning, Water Resources Institute, Territorial waters, Technology, Regional planning, Management planning, Comprehensive planning, Long-term planning, Industrial development, Flood control, Agriculture.

Problems relating to the transfer of knowledge in water resource development which were considered at the United Nations Water Conference in 1977 are summarized. The intent of the conference was to overcome underdevelopment and to improve the efficiency of water use through the promotion of better management. An action plan was proposed, to enhance the transfer of knowledge through public information, education, training, and research and development. Shortages of trained and educated manpower at all levels, together with shortage of financial resources are the major critical constraints impeding transfer and development of water-management technology. Statistics on existing water and sanitary facilities were presented, and future needs of developing countries were projected. Ninety-five percent of existing research facilities are in developed industrial countries. Pilot projects and standardization of engineering services and equipment were among the solutions proposed to improve the global balance of water resource technology. (Titus-FRC)
W81-05653

IMPROVING THE QUALITY OF LIFE,
United Nations Development Program, New York.
P. Bourne.
Water, No 35, p 2-4, November, 1980.

Descriptors: *Developing countries, *International water decade, *Water supply development, Rural areas, Municipal water supply, Drinking water, United Nations, Water supply.

The International Drinking Water Supply and Sanitation Decade, launched in 1980 by the United Nations, can, if successful, bring about great changes in the quality of human life. If the overall goal of providing clean, accessible drinking water and sanitation to all is achieved, it could cut infant mortality in half, revolutionize the role of women in rural areas throughout the world, and dramatically change the economic status of people now living in abject poverty. Improved health and freedom from time-consuming fetching of water could be expected to significantly increase the productivity of large portions of the populations of developing nations. Individual developing countries have been asked to prepare national action plans to achieve the Water Decade's goals. The United Nations Steering Committee for Cooperative Action, chaired by the UN Development Program, is responsible for planning and coordinating the overall strategy and the activities of the various UN agencies. United Nations agencies provide the overall framework, technical support, momentum, and visibility and promotion necessary for the program's success. The most crucial aspect of the program's ultimate success is the need to train adequate personnel at the village level to repair and maintain pumps and as government administrators and planners. In many countries, extensive and intensive educational programs will be needed to encourage people to use the new sources of water of improved quality. Community involvement in the planning and development of the new sources of water supply is the most effective way to ensure the long-range success of these programs. (Carroll-FRC)
W81-05686

6G. Ecologic Impact Of Water Development

BUTTE VALLEY DIVISION, KLAMATH PROJECT, OREGON-CALIFORNIA.
Water and Power Resources Services, Sacramento, CA. Mid-Pacific Region.
For primary bibliographic entry see Field 6D.
W81-05389

POPULATION FLUCTUATIONS OF THE PRAWN, PALAEMONETES PALUDOSUS, IN THE EVERGLADES,
Everglades National Park, Homestead, FL.
J. A. Kushlan, and M. S. Kushlan.
American Midland Naturalist, Vol 103, No 2, p 401-403. April, 1980. 2 Fig, 1 Tab, 9 Ref.

Descriptors: *Water level fluctuations, *Shrimp, *Seasonal variation, Ecosystems, Rainfall, Aquatic populations, *Everglades, Florida, Swamps, Ecological effects, Populations.

The effect of water level on population fluctuations of the prawn, Palaemonetes paludosus, was investigated. In the Everglades, there are substantial fluctuations of water level caused by seasonal and yearly differences in rainfall and overland discharges. Usually, water is high during the summer and autumn, but declines from January through May. The population levels and ecological role of the prawn were influenced by hydrologic conditions. Population levels were relatively high in years when water levels fluctuated in a typical seasonal pattern. Population decreased by about half during two unusual years when the typical dry season did not occur. During the dry season, the organisms are densely concentrated in pools, and with the onset of rains in June, the organisms disperse. Apparently, the prawn is well adapted to survive dry periods and achieves reproductive activity following high water periods. (Small-FRC)
W81-05506

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT OF JONGLEI CANAL PROJECT,
Jonglei Canal Project, Khartoum (Sudan).
A. A. Tahir, and M. O. El Sammani.
Water Supply and Management, Vol 4, No 1/2, p 45-51, 1980. 17 Ref.

Descriptors: *Canals, *Environmental effects, *Social aspects, *Jonglei Canal, *Sudan, Rural sociology, Water resources development, Economics, Agriculture, Swamps.

The construction of the Jonglei Canal, Sudan, will accelerate the social and economic changes already noticeable. Indicators of the population's openness to changes are cattle vaccination, appreciation of education, desire for health services, migration for employment, contact with people, and conveniences of more developed areas, including a clean, adequate water supply. Agricultural pilot farms are being established to study various aspects of farm management, methods and related social aspects. Environmental aspects of the project will also be surveyed, including a proper water management system. (Cassar-FRC)
W81-05668

CONSERVATION V. LAND DRAINAGE--A GUIDE FOR THE FUTURE,
For primary bibliographic entry see Field 4A.
W81-05690

7. RESOURCES DATA

7A. Network Design

THE U.S. GEOLOGICAL SURVEY IN ALASKA, 1981 PROGRAMS.
Geological Survey, Anchorage, AK. Water Resource Div.
Available from Br. of Dist., USGS, 604 S. Pickett St., Alexandria, VA 22304. Geological Survey Circular 843, 1981. 111 p, 25 Fig, 4 Tab. (Reed, K. M., editor).

Descriptors: *Natural resources, *Exploration, Oil, Energy, Mineralogy, Water resources development, Geology, Topographic mapping, Conservation, *Alaska, Outer Continental Shelf, National Petroleum Reserve, *Geological survey, Programs, Projects.

This Circular describes the 1981 programs and projects of the U.S. Geological Survey in Alaska. A brief description of the Alaskan operations of each office and division of the Survey is followed by project descriptions arranged by geographic regions in which the work takes place. The largest program at present is related to oil and gas exploration, but programs also include mineral appraisal, water-resource studies, volcanic and seismic programs, topographic mapping, glaciological and geohazard studies, and many other activities. Alaska is the largest and the least populated, least explored, and least developed of the Nation's

States. The land area contains 375 million acres and comprises 16 percent of the onshore land and more than half of the Outer Continental Shelf of the Nation. After Native and State of Alaska land selections of 44 million acres have been made, approximately 60 percent, 225 million acres, of Alaska land will remain under Federal jurisdiction. Federal lands in Alaska then will comprise approximately 30 percent of all onshore land in the Nation's public domain. (USGS)
W81-05414

SAMPLING–DON'T LEAVE IT ALL TO CHANCE,
Water Research Centre, Stevenage (England).
J. Ellis.
Water, No 35, p 9-12, November, 1980. 3 Fig.

Descriptors: *Sampling, *Statistical methods, *Data processing, Planning, *Network design, Water sampling, Statistical analysis, Data collections.

The design of sampling programs is crucial to the validity of the results and conclusions reached with respect to the data collected. The basic statistical principles of sampling are all essentially matters of common sense. Precise definition of the objective of the sampling program is the most important planning task. The objective must first specify the particular group of values about which inferences are to be made. The conflict between the population required by the objective and the subpopulation dictated by practical considerations may pose significant problems for a sampling design. The population should be defined so as to exclude as much of the variability of time and place that is irrelevant to the objective as possible. The objective must then specify what feature of the defined population is to be estimated, such as mean, percentage above a given level, or 95th percentile. The degree of imprecision which is tolerable in the answer must also be determined. Statistical methods make it possible to relate the quality of the information obtained to the sampling effort expended. However, all statistical methods for quantifying sampling error assume that an independent random sample has been taken. If the type of probability distribution followed by the population is known or can be assumed, it is possible to achieve substantial saving in sampling effort. Estimation of 95th percentiles can be made either without assuming any distribution or with assumption of normality. (Carroll-FRC)
W81-05687

7B. Data Acquisition

MATHEMATICAL MODEL OF GAMMA-RAY SPECTROMETRY BOREHOLE LOGGING FOR QUANTITATIVE ANALYSIS,
Geological Survey, Denver, CO. Water Resources Div.
U. Schimschal.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $3.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-402, 1981. 23 p, 2 Fig, 2 Tab, 4 Ref.

Descriptors: *Mathematical models, *Borehole geophysics, *Gamma radiation, *Well logs, Computer models, Computer programs, Gamma spectrometry, Gamma ray attenuation.

A technique for analyzing gamma-ray spectral-logging data has been developed, in which a digital computer is used to calculate the effects of gamma-ray attentuation in a borehole environment. The computer model allows for the calculation of the effects of lithology, porosity, density, and the thickness of a horizontal layer of uniformly distributed radioactive material surrounding a centralized probe in a cylindrical borehole. The computer program also contains parameters for the calculation of the effects of well casing, drilling fluid, probe housing, and losses through the sodium-iodide crystal. Errors associated with the commonly used mathematical assumption of a point detector are eliminated in this model. (USGS)
W81-05406

A HOMEMADE INSTRUMENT FOR COLLECTING SOIL WATER FROM POROUS CERAMIC CUPS,
Forestry Sciences Lab., Grand Rapids, MN.
M. D. Knighton, and D. E. Streblow.
North Central Forest Experiment Station, St. Paul, Minnesota, Research Note NC-270, 1981. 5 p, 4 Fig, 3 Ref.

Descriptors: *Soil water, *Instrumentation, *Sampling, *Nutrients, Water quality, Leaching, *Ceramic cup, *Porous cup, Soil solution, Nutrient cycling, Nutrient budget.

An efficient Ceramic-Cup Water Collection Instrument (CCWCI, 'quickie') is described. Soil water collection from ceramic-cup samplers may require compositing by equal volume from distantly spaced samplers, or simultaneous water collection from closely spaced samplers without compositing. All collection must be done with minimal opportunity for sample contamination. The CCWCI combines these and other soil water collection needs into a streamlined system that may be adapted to a variety of experimental designs and field conditions.
W81-05431

COMPUTERS IN THE WATER INDUSTRY,
Ferranti Computer Systems Ltd. (England).
E. Dowler.
Water and Waste Treatment, Vol 23, No 7, p 26, 28, 31, July, 1980.

Descriptors: *Computers, *Water management, Water treatment, *Monitoring, Rivers, Flow measurement, Wastewater treatment, *Water treatment facilities, Wastewater facilities.

On-line computer systems are finding application in the water industry for the control and monitoring of a wide range of activities such as water treatment, sewage treatment, and river monitoring. They range from small systems based on a microprocessor or small mini-computer to large multiprocessor schemes. Two examples from opposite ends of the spectrum are described in this paper. One example of a large system is the Hamburg Water Works, which supplies potable water to a population of about two million and to over 30 surrounding municipalities. Ground water is acquired from over 500 wells and treated in 20 water works. Process computer work is currently being expanded into a four-level hierarchical structure employing 13 Argus 700 computers and seven micro-processors. An example of a small system is the Eccles Sewage Treatment Works in the Eastern Division of the North West Water Authority. Here a Ferranti Argus 700E computer with 48K of core memory, a logging printer and a color semigraphic display provide a moderate degree of centralized automatic control. (Baker-FRC)
W81-05483

COST CONTROL THROUGH EFFECTIVE MONITORING INSTRUMENTATION,
B. Philip.
Water and Waste Treatment, Vol 23, No 7, p 36-37, July, 1980.

Descriptors: *Monitoring, *Water use, Measuring instruments, Measuring, Water loss, Water use efficiency, Costs, Cost-benefit analysis, Cost analysis.

Fluid monitoring, while not a new science, has developed over recent years to provide industry with highly accurate electronic metering with permanent record printouts. One of the latest in the field of fluid monitoring devices is equipment designed on a modular basis to provide simplicity coupled with electronic accuracy. The basic modules of the system are a transducer and a recorder, which are able to measure and record changes in the flow level or pressure of liquids. Accurately measuring changes in pressure or pressure differentials, the transducer, operating from an AC or DC power supply, provides continuous reporting on the rate of flow, line pressure or depth of a fluid. The main components of the transducer are a pressure sensing element, a linear variable differential transformer, a linearizing circuit, and a voltage-to-current converting circuit. The benefits of incorporating a monitoring system such as this to measure a company's water committment cannot be underestimated. The economics of such a monitoring system can show savings of many thousands of pounds which can offer a genuine overall contribution to the cost effectiveness of a company's operation. (Baker-FRC)
W81-05484

WHY FIELD FLUOROMETRY.
Water and Waste Treatment, Vol 23, No 4, p 50, 52, 54, April, 1980.

Descriptors: *Fluorometry, Monitoring, Measuring instruments, Field tests, On-site tests, Oil spills, Particulate matter, Flow measurement, *Water analysis.

Fluorometry is an analytical technique for which field instruments have been developed. A portable field unit is available which will withstand temporary immersion and is ideally suited to operation from small survey vessels or on land. Rack-mount versions can also be supplied in weather-resistant cases, and a submersible, high-pressure model can be used for towed or on-station measurements to a depth of 67 meters. Fluorometry measurements are sensitive; analytical errors are avoided since, for most applications, sample concentration by extraction, or filtration is not required. For high concentrations, only a simple dilution is needed. The instruments can be used to follow quantities of oil in the water environment. Fluorometric measurements have been used to establish baselines where oil entry in water was expected, and for detailed study of the proposed sites for new installations or operations involving oil. The methods are also useful for determining flow measurements and time-of-travel studies, for circulation and dispersion studies, for analysis of chlorophyll and pheophytin concentrations in algae, and for monitoring particulate matter. (Baker-FRC)
W81-05485

OXYGEN TRANSFER PARAMETER ESTIMATION,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5D.
W81-05492

REMOTE CONTROL ASSISTS IN FLOOD WARNING.
For primary bibliographic entry see Field 8A.
W81-05498

ANALYSIS OF A NUMERICAL SOLUTION TO THE ONE-DIMENSIONAL STOCHASTIC CONVECTION EQUATION,
Battelle Pacific Northwest Lab., Richland, WA.
C. A. Oster, A. G. Gibbs, and D. H. Tang.
Advances in Water Resources, Vol 4, No 1, p 2-8. March, 1981. 1 Tab, 7 Ref.

Descriptors: *Finite difference method, *Stochastic hydrology, *Conductivity, Mathematical studies, Equations, Flow, Path of pollutants, Transport.

A numerical method for solving the one-dimensional stochastic convection equation was developed which consists of replacing the differential equation by a system of finite difference equations. The Gibbs procedure was used to produce a system of general linear difference equations whose solution is the mean concentration or mean flux of a component at discrete points in time. When using this general system of equations, it is not necessary to solve equations at each step. This paper explores the conditions for the existence of a numerically stable solution to the general system of equations or to an approximate equation. Also, simple samples are presented which demonstrate that the numerical procedure does produce solutions in good agreement with known approximate analytical solutions. The procedure presented here can be extended to higher dimensions, but the analysis of such an extension is fairly complicated.

Applications include contaminant transport. (Small-FRC)
W81-05501

TREATMENT OF TIME DERIVATIVE AND CALCULATION OF FLOW WHEN SOLVING GROUNDWATER FLOW PROBLEMS BY GALERKIN FINITE ELEMENT METHODS,
National Energy Authority, Reykjavik (Iceland).
S. P. Kjaran, and S. T. Sigurdsson.
Advances in Water Resources, Vol 4, No 1, p 23-33. March, 1981. 10 Fig, 16 Ref.

Descriptors: *Differential equations, *Groundwater movement, *Unsteady flow, Flow, Mathematical studies, Finite element method.

Two techniques were developed for solving the linear parabolic differential equation which describes unsteady groundwater flow in an anisotropic non-homogeneous aquifer. The finite element Galerkin method was used. The first technique involves computing the smallest eigenvalues and associated eigenvectors of the matrices arising from the Galerkin method and is a mode superposition technique. This technique permits the interpretation of the response of the groundwater level to input in terms of parallel linear reservoirs. If properly implemented, the technique has computational advantages over conventional standard finite difference methods. The second technique is based on generalized flow formulae for calculating flow values across external or internal boundaries after obtaining groundwater levels. This technique can be used in the case of linear triangular elements on an irregular grid. This technique usually gives more accurate flow values than those obtained directly from groundwater gradients. (Small-FRC)
W81-05503

THE NUTRIENT CONTENT OF PRECIPITATION, DRY FALLOUT, AND INTERCEPTED AEROSOLS IN THE CHAPARRAL OF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara. Dept. of Biological Sciences.
W. H. Schlesinger, and M. M. Hasey.
American Midland Naturalist, Vol 103, No 1, p 114-122. January, 1980. 7 Tab, 35 Ref.

Descriptors: *Nutrients, *Precipitation, *Fallout, Aerosols, Ions, Rainfall, Storms, Fog, *Chemical analysis, Mountains, California.

The relative importance of nutrient deposition in bulk precipitation, intercepted aerosols, and fog water was evaluated in the Santa Ynez mountains of southern California. At five sampling stations, the volume of incident precipitation was measured and chemical analysis was performed. Concentrations and depositions of ions in rainfall and dry fallout were highest at highest evevations. Magnesium and sodium were deposited primarily during storms. Calcium, potassium, and NO3-N were deposited during rainfall and as dry fallout. Estimated total annual inputs were: Ca(2+) 1.4 kg/ha, Mg(2+) 0.8 kg/h^{a}, Na(+) 6.1 kg/ha, K(+) 0.4 kg/ha, and N 1.0 kg/ha. At an elevation of 1050 m, additional precipitation is received as fog drip during winter storms. At all elevations studied, the deposition of ions was greater in collectors containing plastic foliage, probably due to the interception of dry aerosols. Deposition of N from the atmosphere probably exceeded symbiotic nitrogen fixation by shrubs. (Small-FRC)
W81-05504

THE RELATIONSHIP BETWEEN ASBESTOS AND TURBIDITY IN RAW WATER,
Fred Hutchinson Cancer Research Center, Seattle, WA.
For primary bibliographic entry see Field 5A.
W81-05514

IDENTIFICATION OF BEDFORMS IN LOWER COOK INLET, ALASKA,
Geological Survey, Corpus Christi, TX.
A. H. Bouma, M. L. Rappeport, R. C. Orlando, and M. A. Hampton.
Sedimentary Geology, Vol 26, No 1/3, p 157-177, April, 1980. 8 Fig, 20 Ref.

Descriptors: *Sedimentary structures, *Measuring instruments, Inlets, Seismic properties, *Cameras, Seismographs, Seismology, Geophysics, Sonar, Cameras, Bottom currents, Bottom sediments, Water currents, Sand, *Sand waves.

The use of high-resolution seismic profiling, side-scanning sonar, bottom television, and bottom camera provided sufficient data to identify and verify characteristics of small sand waves present on a hard bottom, medium to small sand waves superposed on large sand waves, and the variations present on 'sonograph-smooth' bottoms. These methods were employed to study bedforms in lower Cook Inlet, Alaska. The heights of bedforms determined solely from the acoustic shadow length on sonographs tend to be exaggerated when pebbles or large pieces of organic remains are present. The high acoustic reflectance of such material can be easily confused with a similar acoustic reflectance received from the slope of a sandy bedform. Erroneous calculations of bedform height can result from the interpretation of side-scan records of bedforms that are not visible on bathymetric records if photographic methods cannot be used to confirm these measurements. In the lower Cook Inlet, the bedforms in the sandy sediments include straight-crested to sinuous to lunate ripples, small, medium, and large sand waves, sand ridges, sand ribbons, and sand patches. Rocky and pebbly seafloor has also been identified. Water depth ranges from 25 to 120 meters, with surface currents averaging 3.8 kt (2 meters/second). Bottom currents were measured at 42 cm/second. (Baker-FRC)
W81-05521

A SHORT NOTE ON ERRORS IN RAINFALL MEASUREMENT,
University of Durban-Westville (South Africa). Dept. of Geography.
G. Du T. De Villiers.
Water S A, Vol 6, No 3, p 144-148, July, 1980. 3 Fig, 2 Tab, 8 Ref.

Descriptors: *Rain gages, *Measurement, *Rainfall, Gages, Wind, Instrumentation, Comparison studies.

Six rainfall gages were set up in different fashions to compare the collection efficiencies of each. Two were installed in normal, unprotected, vertical fashion with orifices 1.2 meters above ground level. The third was vertical with the orifice elevated 2.4 meters above ground level. The fourth was vertical, but protected from wind effects by a Nipher screen. The fifth was a pit gage with horizontal orifice, installed at ground level and surrounded by a mat to minimize splashing errors. The sixth was a rotating inclined gage mounted at 20 degrees from zenith, orifice 1.2 meters above the ground. Precipitation data on 37 storms varied widely among the gages. Total rainfall in mm recorded was as follows: 2 vertical gages 594.8, elevated gage 548.0, 2 protected gages 656.0, and inclined gage 873.8. The largest source of error in rain gage data is the assumption that the readings represent the actual precipitation at the site. Corrections using rain vectors and storm inclinations and direction factors may be used to compute true rainfall from vertical gages. (Cassar-FRC)
W81-05566

A PHYSICO-CHEMICAL METHOD FOR THE EXTRACTION OF MARINE AND ESTUARINE BENTHOS FROM CLAYS AND RESISTANT MUDS,
Anglian Water Authority (England).
B. E. Barnett.
Journal of the Marine Biological Association of the United Kingdom, Vol 60, No 1, p 255, 1980. 1 Ref

Descriptors: *Benthic fauna, *Marine sediments, *Separation techniques, Sediments, Estuaries, Clays, Mud, Marine animals, Benthos.

A technique for extracting benthic fauna from such resistant sediment samples as clay and compacted silt is described. Core and grab samples are sieved on site and resistant sediments are returned to the laboratory, where they are stored in a 5 percent formaldehyde solution. The solution fixes and preserves the fauna and helps to break down the clays. After any layers of soft mud are washed off and sieved, remaining resistant samples are frozen for 24 hours and then thawed. This process effectively breaks the resistant sediments into small particles and permits the removal of released animals by elutriation. The remaining coarse sediment particles are broken down by treatment with Calgon water-softening agent. This treatment permits almost all of the sediment remaining to be washed through the sieve. Recovery of benthic fauna is at least as good using this method as using other separation techniques, and the specimens have been preserved in better condition than with other techniques. (Carroll-FRC)
W81-05579

THE MANY USES OF REMOTE SENSING,
T. Kish.
Journal of the Water Pollution Control Federation, Vol 53, No 4, p 420-425, April, 1981. 5 Fig.

Descriptors: *Remote sensing, *Water resources development, *Satellite technology, Weather satellites, Oil spills, Turbidity, Suspended solids, Sediments, Red tide, Industrial wastes, Effluents, Dissolved oxygen, Drainage, Flood forecasting, Aquatic plants, Acidity.

Remote sensing capitalizes on the fact that incident energy striking an object may be transmitted, absorbed, reflected, emitted, or scattered, resulting in identification and measurement of environmental parameters. Measurements must be taken on the ground to obtain actual water quality parameters in conjunction with the use of remote sensing pictures. This is because satellite or airplane borne sensors generally only detect qualitative differences, which must be quantified by calibration with actual water samples from the area in question. Sensing instrumentation includes photographic systems and scanning systems. Scanner systems differ from photographic systems in that incoming radiation is focused on a detector which translates the radiation intensity into a corresponding electronic signal, which is then either displayed on a cathode ray tube or recorded on magnetic tape. Various parameters that are detectable with current equipment include chlorophyll a, turbidity and suspended sediments, dissolved oxygen, poisonous red tides, municipal, industrial, and pulp/paper effluent discharges, oil spills and oil seeps, plugged leachate fields of septic tanks, sanitary waste disposal siting, drainage studies and flood evaluations, acid-iron industrial waste, water depths up to 27 meters, salmon spawning grounds, kelp beds, coastal aquatic vegetation mapping, aquatic vegetation infestations, ground water, tidal zone length, non-point-source pollution, robot water quality monitoring, pH, hazardous waste site leachate, salinity in estuaries, and forecasts of runoff from mountain snow packs. (Baker-FRC)
W81-05618

INSTRUMENTATION FOR CLEAN AND DIRTY WATER,
Thames Water Authority, London (England).
H. L. Thompson.
Effluent and Water Treatment Journal, Vol 20, No 4, p 153-154, 157, 161, April, 1980. 2 Tab.

Descriptors: *Automation, *Control systems, *Water quality control, Water treatment, Wastewater treatment, Water distribution, Measuring instruments, Computers, Cost-benefit analysis, Thames Water Authority, England.

The status of instrumentation and automation in the British water industry is discussed. In the Thames Water Authority, the Metropolitan Water Board and Greater London Council are heavily instrumented, and plans exist to increase automation. Qualitative measurements are much more difficult to estimate than quantitive measurements. Some parameters, such as dissolved oxygen, may be reliably measured, and others such as volatile matter need further development before they can be used for control purposes. Reliable sensors have

been an obstacle in application of automation to water quality control. A very successful ultrasonic device for primary sludge withdrawal is described. A table lists the water quality parameters which are commonly measured continuously, with the range of interest and range of errors. A report by the Working Party on Control Systems in the Water Industry has published an interim report concluding that water treatment processes are already automated to a fair degree, and have few difficulties, but economic advantages have not yet been established. In water distribution systems, automation is cost-effective and subject to few problems. The variability of wastewater makes automatic control difficult to apply in treatment processes. Industrial water and wastewater facilities also use automation, but not much information is available. The trend toward computerized control systems continues. (Cassar-FRC)
W81-05632

THE IMPORTANCE OF FLOW MEASUREMENT,
Water Research Centre, Marlow (England).
J. H. N. Garland.
Effluent and Water Treatment Journal, Vol 20, No 2, p 71-74, February, 1980. 2 Fig, 1 Tab, 9 Ref.

Descriptors: *Flow measurement, *Water quality control, Wastewater dilution, Fate of pollutants, Gaging, Effluents, Rivers, Pollution load.

The dilution ratio (effluent flow:cumulative river flow) is an essential part of analysis, interpretation, and management of water quality data in the case of effluent discharge into rivers. Direct flow measurement is expensive and impractical on a large scale. An alternative is to gage effluents directly and install stream gages at strategic points. The distribution of gaging stations is important for preparation of mass budgets. Although mass flow analysis is a simple form of analysis, it provides useful information about the importance of sources of pollutants and their fate in river systems. The flow weighted mean concentration is a useful statistic because it is directly related to the mean mass flow. Relationships between 95 percentile concentration and the flow weighted mean are suggested as a means of using standards (set as 95 percentiles) to estimate permitted mass flows. (Cassar-FRC)
W81-05633

GETTING A BIRD'S EYE VIEW OF YOUR RESOURCES, PART 1,
G. W. Fraza, and M. E. Holland.
Water and Sewage Works, Vol 127, No 2, p 56-57, February, 1980.

Descriptors: *Water resources development, *Aerial photography, Monitoring, Management, Environmental management, Resources management, *Water management, Watershed management.

Aerial surveillance can significantly reduce the overall field monitoring activities necessary to obtain proper information for water resource management. These aerial surveillance efforts can also provide rapid screening, broad overviews of a wide variety of problems, reconnaissance for swiftly locating a particular problem spot or source of trouble, rapid response to problems, seasonal time-lapse photography to indicate long-term changes in water- and land-related problems and resources, periodic inspections of water treatment facilities, and additional studies concerning complex land and water related influences active in the area. Aerial surveillance can also be used to monitor compliance and thereby become an enforcement tool for administrators or legal officials attempting to maintain specific standards in this area of environmental concern. Staffing for such an aerial program is considered. (Baker-FRC)
W81-05649

GETTING A BIRD'S EYE VIEW OF YOUR RESOURCES, PART 2,
G. W. Fraza, and M. E. Holland.
Water and Sewage Works, Vol 127, No 3, p 38, 39, 47, 58, March, 1980. 2 Fig, 3 Tab.

Descriptors: *Aircraft, *Cost-benefit analysis, *Resources management, Data collections, Water resources, Surveys, Inspection, Reservoirs, Water pollution control.

Aerial surveillance of water resources requires consideration of aircraft availability, degree of centralization of the program, and level of service (total flight hours per year). Aircraft service may be obtained in several ways: purchases, lease, lease-purchase, borrowing, and charter. Centralized operation has several advantages--a greater degree of program control, more consistency in activities and output, coordination among agencies, and freedom from administrative details for technical personnel. However, decentralized operation offers greater flexibility and adaptability to local needs. Costs are compared for three levels of use: 110, 450, and 800 hours per year, for lease, purchase, and charter plans. For 800 hours per year use, the purchase plan is cheaper, $100,534; for 110 hours per year the charter plan was least expensive, $24,795. Leasing was most costly. Tables for comparing benefits vs. levels of service and benefits vs. aircraft aquisition plans are presented. (Cassar-FRC)
W81-05650

GETTING A BIRD'S EYE VIEW OF YOUR RESOURCES, PART 3,
G. W. Fraza, and M. E. Holland.
Water and Sewage Works, Vol 127, No 5, p 66, 77, May, 1980. 3 Fig.

Descriptors: *Monitoring, *Aerial photography, Photography, Field tests, Evaluation, On-site tests, Resources, Water resources development, *Water pollution, Path of pollutants.

Years of aerial surveillance have demonstrated that typical water pollution and water quality impairment problems are recognizable from the air during on-site evaluation without great difficulty. A check list is provided of routine matters to be taken care of prior to flight to ensure success of the mission. It is recommended that photographic equipment be hand-held rather than using rigid mountings, since the hand-held camera is provided with ideal motion damping. The best pictures are usually taken through the open window, if possible. However, pointers are offered on ways to shoot through a closed window if that is necessary. (Baker-FRC)
W81-05651

7C. Evaluation, Processing and Publication

STREAM-TEMPERATURE PATTERNS OF THE MUDDY CREEK BASIN, ANNE ARUNDEL COUNTY, MARYLAND,
Geological Survey, Reston, VA. Water Resources Div.
E. J. Pluhowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-226854, Price codes: A07 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 81-18, April, 1981. 135 p, 16 Fig, 10 Tab, 20 Ref.

Descriptors: *Streamflow, *Water temperature, *Data collections, *Hydrologic budget, Land use, Solar radiation, Evapotranspiration, Precipitation, Runoff, Turbidity, Sediment concentration, *Maryland, Anne Arundel County, Muddy Creek basin.

Using a water-balance equation based on a 4.25-year gaging-station record on North Fork Muddy Creek, the following mean annual values were obtained for the Muddy Creek basin: precipitation, 49.0 inches; evapotranspiration, 28.0 inches; runoff, 18.5 inches; and underflow, 2.5 inches. Average freshwater outflow from the Muddy Creek basin to the Rhode River estuary was 12.2 cfs during the period October 1, 1971, to December 31, 1975. Harmonic equations were used to describe seasonal maximum and minimum stream-temperature patterns at 12 sites in the basin. These equations were fitted to continuous water-temperature data obtained periodically at each site between November 1970 and June 1978. The harmonic equations explain at least 78 percent of the variance in maximum stream temperatures and 81 percent of the variance in minimum temperatures. Standard errors of estimate averaged 2.3C (Celsius) for daily maximum water temperatures and 2.1C for daily minimum temperatures. Mean annual water temperatures developed for a 5.4-year base period ranged from 11.9C at Muddy Creek to 13.1C at Many Fork Branch. The largest variations in stream temperatures were detected at thermograph sites below ponded reaches and where forest coverage was sparse or missing. At most sites the largest variations in daily water temperatures were recorded in April whereas the smallest were in September and October. The low thermal inertia of streams in the Muddy Creek basin tends to amplify the impact of surface energy-exchange processes on short-period stream-temperature patterns. Thus, in response to meteorologic events, wide ranging stream-temperature perturbations of as much as 6C have been documented in the basin. (USGS)
W81-05394

HYDROLOGIC DATA FOR THE CACHE CREEK-BEAR THRUST ENVIRONMENTAL IMPACT STATEMENT NEAR JACKSON, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
G. S. Craig, Jr., B. H. Ringen, and E. R. Cox.
Available from OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $9.00 in paper copy, $12.00 in microfiche. Geological Survey Open-File Report 81-410, March, 1981. 46 p, 5 Fig, 8 Tab, 16 Ref.

Descriptors: *Hydrologic data, *Surface water, *Groundwater, *Water quality, Streamflow, Gaging stations, Sampling, Sites, Flood frequency, Suspended sediments, Particle size, Erosion, Wells, Springs, Chemical analysis, Geologic units, Environmental impact statement, *Wyoming, Bridger-Teton National Forest, Gros Ventre Wilderness area.

Information on the quantity and quality of surface and ground water in an area of concern for the Cache Creek-Bear Thrust Environmental Impact Statement in northwestern Wyoming is presented without interpretation. The environmental impact statement is being prepared jointly by the U.S. Geological Survey and the U.S. Forest Service and concerns proposed exploration and development of oil and gas on leased Federal land near Jackson, Wyoming. Information includes data from a gaging station on Cache Creek and from wells, springs, and miscellaneous sites on streams. Data include streamflow, chemical and suspended-sediment quality of streams, and the occurrence and chemical quality of ground water. (USGS)
W81-05395

WATER RESOURCES OF UPPER SEPARATION CREEK BASIN, SOUTH-CENTRAL WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
L. R. Larson, and E. A. Zimmerman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-224263, Price codes: A05 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-85, April, 1981. 69 p, 31 Fig, 10 Tab, 17 Ref.

Descriptors: *Hydrologic data, *Surface water availability, *Groundwater availability, Water demand, Streamflow, Snowmelt, Runoff, Watersheds, Water quality, Chemical analysis, Sediment load, Salinity, Springs, Wells, Water yield, *Wyoming, Upper Separation Creek basin.

Expected development of coal in the 85-square-mile upper Separation Creek basin of south-central Wyoming will greatly increase the demands on water resources. Flows in Separation Creek are seasonal and highly variable. Streamflow is primarily caused by snowmelt. Very light snowpack in the spring of 1977 resulted in annual runoff being

only 10 percent of that for the previous year. Surface-water quality is variable in both time and space. Dissolved-solids concentrations ranged from less than 100 to more than 1,500 milligrams per liter. Flushing of accumulated salts occurs during a rising stage. Ground water is obtainable from the Mesaverde Formation, the Lance and Fort Union Formations, and from alluvium. Yields from wells and springs are usually less than 10 gallons per minute, though some springs flow as much as 35 gallons per minute. Ground-water quality varies with the formation. Stream biota are governed by the intermittent nature of the stream and by habitat. Daily mean sediment concentrations ranged from 34 to 11,900 milligrams per liter. (USGS)
W81-05396

SELECTED HYDROLOGIC AND CLIMATOLOGIC DATA FROM THE PRAIRIE DOG CREEK BASIN, SOUTHEASTERN MONTANA, WATER YEAR 1979,
Geological Survey, Helena, MT. Water Resources Div.
L. E. Cary, and J. D. Johnson.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $10.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-412, 1981. 73 p, 1 Fig, 23 Tab, 3 Ref.

Descriptors: *Data collections, *Hydrologic data, *Climatic data, Precipitation, Air temperature, Relative humidity, Solar radiation, Wind, Soil temperature, Soil water, Streamflow, Water quality, Chemical analysis, Suspended sediments, Model studies.

Hydrologic and climatologic data are being collected in a 19-square-mile (49-square-kilometer) basin in southeastern Montana to provide a base for development, calibration, and verification of a precipitation-runoff model. The study area and data-collection stations within the area are shown on a map. A summary of data collected at each station during the first year, beginning in October 1978, is provided in tables. The data include precipitation, snow depth and water content, air temperature, relative humidity, wind run, solar radiation, soil temperature and moisture, stream discharge, chemical analyses of water, and suspended sediment. (USGS)
W81-05397

DATA FROM GEOTHERMAL WELLS NEAR OASIS, LOWER COACHELLA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. H. Robison.
Available from OFSS, USGS Box 25425, Fed Ctr Denver, CO 80225 Price: $3.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-411, 1981. 26 p, 14 Fig, 2 Tab.

Descriptors: *Hydrologic data, *Geothermal studies, *Water quality, *Test wells, Sites, Drillers logs, Observation wells, Temperature gradient, Thermal water, Chemical analysis, *California, Lower Coachella Valley, Water level.

This report includes drillers' logs, temperature logs, and water quality analyses from geothermal tests made at 11 sites near Oasis, lower Coachella Valley, California. A map shows the locations of the wells and also included is the location-numbering system for wells. (USGS)
W81-05398

PRELIMINARY DATA REPORT FOR THE SAN JUAN BASIN-CROWNPOINT SURVEILLANCE STUDY,
Geological Survey, Albuquerque, NM. Water Resources Div.
P. F. Frenzel, S. D. Craigg, and E. T. Padgett.
Available from OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $10.50 in paper copy, $6.00 in microfiche. Geological Survey Open-File Report 81-484, March, 1981. 33 p, 4 Fig, 5 Plates, 3 Tab, 4 Ref.

Descriptors: *Data collections, *Groundwater, *Water quality, *Observation wells, Well data, Water level, Transmissivity, Storage coefficient, Chemical analysis, Maps, *New Mexico, Crownpoint, San Juan basin.

Geohydrologic data that may be used to predict the effects of mining on Navajo water resources in the San Juan structural basin are reported as well as the current availability of data from other government agencies. Emphasis is on the vicinity of Crownpoint, New Mexico. (USGS)
W81-05401

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, SEPTEMBER 1980,
Geological Survey, Tampa, FL. Water Resources Div.
D. K. Yobbi, W. M. Woodham, and G. R. Schiner.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1280, 1980. 1 Sheet.

Descriptors: *Potentiometric level, *Groundwater, *Maps, Aquifers, *Water table, Wells, Water level fluctuations, Pumping, Irrigation, *Southwest Florida, Southwest Florida Water Management, Florida.

A September 1980 potentiometric-surface map of the Southwest Florida Water Management District depicts the annual high water-level period. Potentiometric levels rose 1 to 31 feet between May 1980 and September 1980 in the citrus and farming sections of southern Hillsborough, northern Hardee, southwestern Polk, northwestern DeSoto, and Manatee Counties. Water levels in these areas are widely affected by reduced pumping for irrigation and have the greatest range in fluctuations. Generally, potentiometric levels were lower than previous September levels except in Citrus, eastern Levy, and western Marion Counties where levels were 0 to 8 feet higher. (USGS)
W81-05407

GROUND-WATER LEVELS IN SELECTED WELL FIELDS AND IN WEST-CENTRAL FLORIDA. SEPTEMBER 1980,
Geological Survey, Tampa, FL. Water Resources Div.
D. K. Yobbi, L. R. Mills, and W. M. Woodham.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $7.00 in paper copy, $1.00 in microfiche. Geological Survey Open-File Report 81-77, 1980. 2 Sheets, 2 Tab, 1 Ref.

Descriptors: *Potentiometric level, *Groundwater, *Maps, Subsurface water, Aquifers, *Water table, Wells, Water level fluctuations, *West-Central Florida, Floridan aquifer, Florida.

The water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer in a 1,200-square-mile area in west-central Florida are mapped semiannually by the U.S. Geological Survey. Maps are based on water levels measured in wells each May to coincide with seasonal low levels and each September to coincide with seasonal high levels. The mapped area shows 14 well fields that supplied 141.8 million gallons to municipalities on September 18, 1980. The water is withdrawn from the Floridan aquifer, the major aquifer in Florida. The effect of localized withdrawal of ground water is shown on the maps as depressions in both the potentiometric and water-table surfaces. Potentiometric levels in the Floridan aquifer were higher in September 1980 than in May 1980 and generally lower than in September 1979. Annual change of water levels ranged from a decrease of 6 feet at Morris Bridge well field to an increase of 2 feet at Eldridge-Wilde well field. (USGS)
W81-05408

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN TEXAS--FISCAL YEAR 1981.
Geological Survey, Austin, TX. Water Resources Div.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 81-347, March, 1981. 44 p, (Compiled by Mitchell, A. A., and Buckner, H. D.).

Descriptors: *Hydrologic data, *Data collections, Surface water, Groundwater, Water quality, Streamflow, Sediment transport, Reservoirs, Wells, Aquifers, Drawdown, Land subsidence, Water level, Estuaries, Tides, Chemical analysis, Sampling, Sites, Maps, Flood plains, Cooperatives, *Texas.

This report describes the water-resources projects and activities of the Geological Survey in Texas for the 1981 fiscal year (October 1, 1980, to September 30, 1981). A continuing series of measurements and quantitative analyses are made of streamflow, reservoir contents, and estuarine flow. In addition, data are collected on the chemical quality of water and sediment in streams and reservoirs, water levels in wells, and land-surface subsidence. By the end of the 1981 fiscal year, the following installations will be in operation: Approximately 677 digital recorders at stream-gaging, tide-level, and rainfall stations; 15 conductivity (digital) recorders; 5 instruments for continuously monitoring and recording the water-quality characteristics of conductivity, water temperature, dissolved oxygen, and pH; and 6 continuous recorders for water temperature. Ground-water data are collected at more than 1,300 observation wells. Water levels are measured continuously in 29 wells and periodically in 1,000 wells; chemical-quality data are collected in 300 wells; and subsidence data are collected in 13 wells. (USGS)
W81-05409

APPROXIMATE WATER-LEVEL CHANGES IN WELLS IN THE CHICOT AND EVANGELINE AQUIFERS 1977-81 AND 1980-81, AND MEASURED COMPACTION 1973-81, IN THE HOUSTON-GALVESTON REGION, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
R. K. Gabrysch, and C. E. Ranzau, Jr.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.00 in paper copy, $5.50 in microfiche. Geological Survey Open-File Report 81-341, March, 1981. 3 Sheets, 3 Fig, 1 Ref.

Descriptors: *Aquifers, *Groundwater, *Wells, *Water level fluctuations, *Compaction, Land subsidence, Maps, *Texas, Chicot aquifer, Evangeline aquifer, Galveston County, Harris County.

This report consists of: (1) Four maps that present data on water-level changes during 1977-81 and 1980-81 in the Chicot and Evangeline aquifers and (2) one set of graphs that present data on the compaction of subsurface materials for 1973-81. During these periods, ground-water pumping decreased in Galveston County and southern Harris County, Tex., and increased in northern and western Harris County. (USGS)
W81-05412

PACKED BED BIOFILM REACTORS: SIMPLIFIED MODEL,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W81-05495

THE PROBLEM OF SPATIALLY REPRESENTING LOW STREAMFLOW,
Sussex Univ., Brighton (England).
T. J. Browne.
Water Services, Vol 84, No 1010, p 223-226, April, 1980. 5 Fig, 12 Ref.

Descriptors: *Mapping, *Streamflow, *Low flow, Isopleth, Flow line maps, Hydrology, Rivers, Tributaries.

Flow line and isopleth maps were compared as means of representing low streamflow. The flow line technique, which concentrates on the river itself, uses a line following the river course. The line is thicker in areas of larger flow (i.e., toward the river mouth) and thinner in the tributaries. The isopleth technique connects areas of similar magnitude, and gradient is implied by spacing of the isopleths. This method works rather well with large streamflows and on a large scale, but it is not well suited to highlighting small, local variations from the regional pattern. It requires more data points and more subjectivity than the flow line method. Examples of the River Creedy and River Otter catchments show that the flow line method provides a more easily visualized representation of low flow on a limited scale and uses fewer data points than the isopleth method. (Cassar-FRC)
W81-05513

8. ENGINEERING WORKS

8A. Structures

BREAKWATER PIER APPARATUS,
J. J. Treu.
U.S. Patent No 4,225,268, 7 p, 4 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1835. September 30, 1980.

Descriptors: *Patents, *Breakwaters, *Piers, *Coastal structures, Harbors, Ocean waves, Shore protection, Floating.

A breakwater pier apparatus is disclosed which can be deployed in selected lengths to encircle a yacht basin. It not only provides breakwater protection to the interior of the yacht basin, but it also defines an outer wall which defines a set of adjacent berths in it. A framework is floated in the water by buoyant tanks. The apparatus includes a rearwardly sloping wave energy absorbing wall adapted to float partly underwater and partly above the surface of the water and facing the direction of the wave action. This wave energy absorbing wall is slotted to intercept part of the wave action to create a force tending to hold the breakwater in vertical position. The framework includes an upright wall which also floats partly out of the water. Appended to the wall is a set of floating stub piers for individual boat anchorages. The apparatus is tethered or guided on an upstanding piling. (Sinha-OEIS)
W81-05417

FUNNEL-SHAPED STRUCTURAL BLOCK AND ASSEMBLIES OF SUCH BLOCKS FOR SHORE PROTECTION,
A. Matsui.
U.S. Patent No 4,225,269, 9 p, 8 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 998, No 5, p 1835. September 30, 1980.

Descriptors: *Patents, *Shore protection, *Coastal structures, Coastal engineering, *Breakwaters, Beach erosion, Ocean waves.

For use as a structural unit in variety of coastal and other civil engineering works, a formed block or pile of concrete or other material is provided which comprises a conical body and a cylindrical leg extending coaxially from the vertex of the body. Offshore breakwaters can be built by laying a multiplicity of such funnel-shaped blocks into one or, usually, two or more superposed horizontal layers, with each block having its leg oriented downwardly. At least the lowermost layer of blocks are buried directly into the seabed, and the upper layer or layers of blocks are installed with or without use of a support structure serving to prop up each block. Thus, the combined effect of the inverted-conical shape of the body of the block and the leg imparts great stability to the block and therefore to the entire assembled structure. Another property of the funnel-shaped structural block is its excellent wave damping ability. (Sinha-OEIS)
W81-05418

STORM OVERFLOW BASIN,
For primary bibliographic entry see Field 4A.
W81-05420

ASSESSMENT OF MONITORING TECHNOLOGY - APPLICATIONS TO EARTH DAM SAFETY,
Idaho Univ., Moscow. Water and Energy Research Inst.
R. Hays, T. R. Howard, J. N. Peterson, and G. Garrabrant.
Research Technical Completion Report submitted to Idaho Department of Water Resources, January, 1981. 189 p, 16 Fig, 8 Tab, 4 Graphs, 168 Ref, 3 Append.

Descriptors: *Earth dams, *Dam stability, *Dam failure, *Monitoring, *Stress analysis, Acoustics, Data interpretation, Sound waves, Seepage control, Slope stability, Piezometers, Resonance, Refractivity, Groundwater movement.

A statistical analysis was made of past earth dam failures to determine the causes of failure. Twelve major categories were identified and two were determined as the most common: seepage and embankment sliding. Current and developing technologies to help ensure dam safety were evaluated for primary use, advantages, disadvantages, availability, and cost. The type of equipment selected had to be inexpensive, portable, and easily operated, and the resulting data had to be easily interpreted and accurate. Additionally, it had to provide some warning time for failure. Various equipment was surveyed including tracers, radar, infrared sensing, microwave sensing, and seismic methods. An Acoustic Emission Monitoring System was selected. Acoustic emissions are the noises generated when a material deforms thereby mobilizing stress waves. A metal bar (waveguide) is inserted into the suspect area and an accelerometer is attached to it. The accelerometer converts the noise from the waveguide into an electrical impulse, which is then filtered and amplified. If the impulse crosses a preset level, it registers on a digital display. The higher the number of counts in a given time, the higher the deformation. Acoustic Emission data should be used only as a guideline on dam stability; the age of the dam, wind conditions, and the past history of the dam must also be considered. When the Acoustic Emission System is used, certain criteria must be met regarding the length of the waveguides, waveguide placement, length of monitoring time, location, and weather conditions. The system is excellent for monitoring slope stability and shows promise for seepage detection; however, more work needs to be done. (Atkins-Omniplan)
W81-05444

EMITTER DISCHARGE SENSITIVITY TO PRESSURE AND TEMPERATURE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W81-05468

MAXIMUM CLEAR-WATER SCOUR AROUND CIRCULAR PIERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY5, p 611-626. May, 1981. 11 Fig, 3 Tab, 30 Ref.

Descriptors: *Scour, *Piers, Bridge construction, Abutments, Docks, Channel scour, Abrasion, Erosion, Sedimentation, Design criteria.

The potential predictors of the maximum clear-water scour are compared with the experimental data. Limitations of these predictors are considered. A formula to predict the maximum clear-water scour is proposed. Phenomena involving local scour around bridge piers have been studied most extensively in laboratory experiments, from which several empirical formulas have been developed to estimate the maximum scour depths around bridge piers. The range of flow parameters for which the formulas presented overpredicted or underpredicted the results were delineated. Predictors which enveloped all the data were identified. The comparison indicated that the scour formula by Laursen and Toch was the best predictor among those compared in this study, as it enveloped all data and overpredicted less than the other formulas. However, the Laursen and Toch formula predicted that the scour depth was independent of sediment size. Another formula is also considered for the maximum clear-water scour which was very similar to that of Laursen and Toch, but included the effect of sediment size on scour depth. (Baker-FRC)
W81-05478

HAZARD ASSESSMENT OF ARCH DAM IN SEISMIC ZONE,
Beck (R.W.) and Associates, Seattle, WA.
D. E. Bowes, A. X. Sison, and A. L. O'Neill.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY2, p 193-208. February, 1981. 7 Fig, 8 Tab, 27 Ref.

Descriptors: *Arch dams, *Seismic properties, *Stress analysis, Hazards, Dam stability, Earthquakes, Geologic faults, Reservoirs, Hydraulic structures, Green Lake Hydroelectric Project, Sitka, *Alaska.

The Green Lake Hydroelectric Project currently under construction near Sitka, Alaska, involves a concrete double curvature arch dam and a reservoir with a total storage capacity of 90,000 acre-feet. Since this is a seismic area, a thorough assessment of the geology and the hazards posed by three major faults was conducted. It was estimated that the maximum credible earthquake would have a Richter magnitude of 7-8, maximum rock acceleration of 0.28-0.40 grams, and duration of strong shaking 26-45 sec. An analysis of the dam for Class I and Class II (maximum credible earthquake) (expected to occur once during 100 years) earthquakes showed that the vertical contraction joints would partially open during vibration, redistributing the stresses within the structure. A Class II earthquake would not disrupt normal operation of the dam. A Class I earthquake would produce minor damage, but would not allow uncontrolled release of water from the reservoir. (Cassar-FRC)
W81-05480

REMOTE CONTROL ASSISTS IN FLOOD WARNING.
Water and Waste Treatment, Vol 23, No 2, p 4, February, 1980.

Descriptors: *Flood control, *Telemetry, Remote sensing, Flood protection, Headwater control, Flood forecasting, Forecasting, Floods, *Tidal floods, Hull River, Plymouth, England.

A tidal surge barrier was constructed across the River Hull in Plymouth to protect parts of the town from flooding during exceptionally high tides and storm surges. The scheme involves a single turnover lift gate for the barrier with an overall width of 30 meters. The gate is suspended by chains with counterweights which are supported within towers on each side of the river. Operating machinery is contained in rooms at the top of each tower. Detailed monitoring of tide levels is required to make a scheme like this function. Level transducers were installed at various levels in the mouth of the Humber and at other points. The transducers feed information via radio and land line links to a visual display unit (VDU) with micro-processor and storage facilities, housed in a control room in one of the towers. The information is combined graphically on the VDU with stored data relating to predicted levels and times, supplied by the Institute of Oceanographic Research. This information will assist in calculating the time of barrier operation. The grouped information is then relayed by radio paths to water authority offices nine miles away. Here it is monitored and displayed as alarm information or as graphical information on multi-point recorders. (Baker-FRC)
W81-05498

SINGLE MULTIPURPOSE RESERVOIR DESIGN: A MODIFIED OPTIMAL CONTROL PROBLEM BY CHANCE-CONSTRAINED PROGRAMMING,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
M. A. Marino, and S. P. Simonovic.
Advances in Water Resources, Vol 4, No 1, p 43-48, March, 1981. 1 Fig, 4 Tab, 6 Ref.

Descriptors: *Reservoir design, *Mathematical model, *Linear programming, Controlled storage, Reservoir operation, Flow control, Mathematical studies.

A method is presented for solving a reservoir sizing problem using a chance-constrained programming model. The model can also be used to solve an optimal control problem. The algorithm was developed for solving complex stochastic problems of multipurpose reservoir planning and design. The first step includes transformation of chance constraints on the state and control variables. In the second step, the choice of optimum control or optimal reservoir storage is carried out. The first step uses convolution, while the second step uses linear programming. Random inflows and random demands can be used. An example of a reservoir design problem is presented that has three different types of downstream releases: hydropower production, municipal water supply, and irrigation. (Small-FRC)
W81-05502

COST-EFFECTIVE COMBINED SEWER OVERFLOW POLLUTION ABATEMENT PLANNING,
Bogert (Clinton) Associates, Fort Lee, NJ.
H. L. Kaufman, and F. Lai.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2220-2229, August, 1980. 8 Fig, 1 Tab.

Descriptors: *Pollution abatement, *Overflow, *Combined sewer overflows, *Storm water, Model studies, Water pollution control, Wastewater treatment, Sewers, Cost analysis, Alternative planning, Planning, Precipitation(Atmospheric), Statistics, Mathematical models, Rainfall, Storage, Flow control.

The interaction of elements in a combined sewer system (collection system, interceptors, storage, and treatment works) was analyzed and methods developed to evaluate alternatives for cost-effective solutions for overflow pollution abatement. The tools included two mathematical models (EPA's SWMM, Storm Water Management Model; and Corps of Engineer's STORM, Storage, Treatment, Overflow, and Runoff Model), a normalized hydrograph, and a synthetic rainfall hydrograph developed to reproduce probable frequency volumes. The information was applied to data collected in Elizabeth, New Jersey. Several conclusions were apparent. For pollution abatement, it is important to capture the first flush of the combined sewers after a dry period. This low volume water contains high concentrations of pollutants. Sewer flushing during dry weather may reduce first flush pollutant concentrations significantly. Other measures which can improve pollution control are containment of overflow for later treatment, upstream storage and infiltration ponds, peak storm flow storage in enlarged laterals or parallel sewers, and flow routing. (Cassar-FRC)
W81-05545

PIPE STORAGE FOR EQUALIZATION OF BACKWASH DISCHARGES TO SANITARY SEWERS,
Randolph and Associates, Inc., Peoria, IL.
R. M. Randolph, J. L. Borders, and R. B. Helm.
Journal of the Water Pollution Control Federation, Vol 52, No 8, p 2193-2198, August, 1980. 4 Fig, 3 Tab, 1 Ref.

Descriptors: *Pipe storage, *Equalizing systems, *Filters, Sewerage, Discharge lines, Design criteria, Costs, Operation and maintenance, Capital costs, *Water treatment.

Pipe storage was selected from among several alternatives for equalizing backwash discharge from the North Tazewell Public Water District, Illinois, water treatment plant before introducing it into a sewer system. Initial capital costs (1976) for this underground facility were $61,022, vs. $74,779 for a conventional rectangular basin design. An existing storm sewer was incorporated into the system to save money. Design criteria were: backwash rate per filter, 420 gal per min; backwash time per filter, 15 min; maximum backwash frequency, 9 filters per 24 hours; and discharge rate to the sewer, 65 gal per min average and 90 gal per min maximum. Additional advantages of underground pipe storage are: lower annual operation and maintenance costs because pumps and pump controls are not necessary; lack of problems due to weather extremes, security, noise, odors, icing, and insects; and the fact that the land surface is usable as a parking lot, garden, or for other purposes. (Cassar-FRC)
W81-05554

LONGITUDINAL VIBRATIONS OF EMBANKMENT DAMS,
Case Western Reserve Univ., Cleveland, OH. Dept. of Civil Engineering.
G. Gazetas.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT1, p 21-40, January, 1981. 7 Fig, 2 Tab, 11 Ref.

Descriptors: *Dams, *Vibrations, *Earthquakes, Embankments, Rockfill dams, Earth dams, Dam stability, Mathematical models, Mathematical studies.

A theoretical analysis is presented of free and forced vibrations of embankment dams. Both dilatational and shear deformations are accounted for, and the dam is modeled as a linear, homogeneous triangular prism, bounded in the longitudinal direction by two vertical planes. Numerical results are presented for the natural frequencies, modal displacement, modal strain shapes, and modal participation factors. In relatively long dams, the model indicated that shear deformations are more important than axial deformations. The reverse is true in dams that are built in narrow canyons. In order to evaluate the ability of the theory to explain observed field behavior, two case studies are presented: the Santa Felicia Dam in California and the Kisenyama Dam in Japan. Natural frequencies, participation factors, and mode shapes were computed and compared with observed values. Agreement was found with the Santa Felicia Dam data, but the method failed to explain the observed sharp increase of the motion near the crest of the Kisenyama rockfill dam during a moderate earthquake. (Small-FRC)
W81-05584

FLOOD GATE TACKLES 40-YEAR STORM,
Onondaga County, Syracuse, NY.
J. J. Hennigan, Jr.
American City and County, Vol 96, No 4, p 53-55, April, 1981. 2 Fig.

Descriptors: *Flood control, *Flood protection, *Floodgates, Gates, Flood-control storage, New York, Onondaga County, *Syracuse, Economic aspects, Flow discharge, Flood discharge, Flow rates.

Recurrent spring flooding and a major flood led Onondaga County in New York State to evaluate options for controlling the periodic flooding of Harbor Brook in Syracuse. Since enlargement of the channel capacity of the stream would only have shifted the site of the flooding, the creation of a detention basin upstream from the flood-prone areas was the most attractive solution. Cost and siting difficulties resulted in the establishment of a detention basin smaller than that recommended by consulting engineers. In order to meet the original objectives, an automatic flow control gate was installed at the outlet of the basin. The Avio constant downstream level gate provides for increases in the basin's discharge rate as the water level in the reservoir rises, allowing maximum discharge to occur during the early phase of severe storms. The gate cost $50,000, and another $250,000 was required for its installation and related control structures. Following a court ruling that the Town of Onondaga, which covers about 77 percent of the drainage basin, would not benefit from the flood control measures, the City of Syracuse was forced to assume 93 percent of the cost of the project. (Carroll-FRC)
W81-05643

BRITAIN'S SEWERS - THE DEVELOPMENT OF THE SEWERAGE SYSTEM,
D. F. Rees.
Water Services, Vol 85, No 1020, p 66-68, February, 1981. 4 Fig, 3 Ref.

Descriptors: *Sewer systems, *England, Wastewater facilities, Municipal wastes, Domestic wastes, Industrial wastes, Municipal wastewater, History.

The history of the sewer system in England is reviewed. In 1856 the Metropolis Management Act was passed which effected measures that would tackle London's problems with sewerage. Particularly pressing was the problem of sewerage entering the Thames within the metropolitan area. Within 15 years some 100 miles of sewers had been constructed under difficult conditions. Today the Metropolitan Public Health division of Thames Water Authority is responsible for a population of 8 million spread over 850 square miles. The Public Health Act of 1975 produced a high rate of activity in sewerage, particularly in the areas of industrial growth. Currently the assessment of sewerage needs in England pertains to maintenance, renovation and renewing of existing sewers which are in all other respects acceptable as to location and purpose. (Baker-FRC)
W81-05658

COASTAL ENGINEERING AND CONSTRUCTION IN JAPAN,
Stanford Univ., CA. Dept. of Civil Engineering.
B. C. Paulson Jr.
Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers, Vol 107, No WW1, P 11-26, February, 1981. 9 Fig, 1 Tab, 12 Ref.

Descriptors: *Foreign construction, *Coastal engineering, *Underwater, Bridge construction, Construction, Coasts, Harbors, *Japan.

The engineering and construction of coastal structures in Japan is reviewed, based on interviews with people in the Japanese construction industry. Japan has 16,470 miles of coastline and extensive experience in underwater structures. Three current major projects, floating petroleum barges, the Kashima port-industrial complex, and the Honshu-Shikoku bridge system are described. The floating concrete storage barges are designed to provide greater safety and have less environmental impact than surface tanks. The structures will be isolated from earthquake shocks, free from foundation settlement problems, require less construction time, and cost about the same as land tanks. The Honshu-Shikoku bridges, one of the most ambitious construction schemes in the world, are designed to comprise 18 bridges. One of these, at 3650 m, will be the longest bridge in the world (Akashi Kaikyo suspension bridge). The Kashima Port-Industrial complex comprises an area of 750 sq km and extends 60 km along the coast. It includes a manmade harbor with a channel which can handle ships up to 15,000 dwt. Exchange of ideas with Japan through ASCE and JSPS programs can help solve problems and prevent duplication of effort. (Small-FRC)
W81-05659

ARDINGLY RESERVOIR AND ASSOCIATED WORKS,
Water Services, Vol 84, No 1012, p 348, 350-351, June, 1980. 2 Fig.

Descriptors: *Earth dams, *Reservoirs, *Reservoir construction, Reservoir siting, *Water treatment,

Filtration, Water quality, River flow, Water resources development, Ardingly.

A reservoir and river augmentation scheme was developed by the Mid-Sussex Water Company and the Sussex River Authority. The Ardingly dam was constructed of Wadhurst clay and alluvium fill with sand drains, filters, and a sand blanket base. The capacity of the reservoir thus formed is 5.2 M cu m, with a surface area of 77.2 ha and a catchment area of 2300 ha. There is a valve tower which permits drawoff of water directly to Shell Brook treatment works at three levels. Its main function is to regulate flow in the River Ouse via the main overflow and discharge culvert through the dam. Five additional outlets and two mains tappings are provided within the tower for water quality sampling and dissolved oxygen and temperature measurement. The water is screened before being sent to the treatment plant. It is dosed with ferric sulfate in the inlet channel to the sedimentation tanks. The pH is raised, and filtration is achieved with rapid gravity filters consisting of a graded sand bed. Chlorine is added, followed by dechlorination to reduce chlorine to acceptable levels. The water works are fully automatic and require attendance for only one shift a day. (Small-FRC)
W81-05661

QUALITY ASSURANCE - GETTING VALUE FOR YOUR MONEY,
J. S. M. Willis.
Water Service, Vol 85, No 1020, p 89-90, February, 1981.

Descriptors: *Quality control, *Inspection, Engineering, Civil engineering, Structural engineering, Systems engineering, Materials engineering, Engineering personnel, Hydraulic engineering, Construction materials, Management planning.

Quality assurance starts at the specification stage. In today's market, however, suppliers and contractors often offer new products and processes for which no adequate specifications have yet been devised. Changes in recent years in the structure of manufacturing industries have increased the problem of obtaining quality control criteria. Traditionally the inspecting engineers are the experts on quality of materials and manufacturing and are generally responsible for checking and controlling the quality of goods produced off-site from a building project. By seeking consultation with these individuals before work begins, much time can be saved. Advice can be obtained on the choice of materials, processes and equipment to use. Assistance can be gained with specifications for materials and processes. The manufacturing capability and skill of would-be participants can be assessed. Supervision of manufacture, construction and installation can be secured. Advice on authorization to stage payments can be gained along with checking the proper commissioning, and testing of the installed plant. The design engineer has in the past been responsible for the selection and specification of materials and plant, the resident engineer for its construction, installation and commissioning, and inspection engineers for maintaining quality control. The trend now is to include the inspection engineers at an early point and continue to rely on them during the completion of the task. (Baker-FRC)
W81-05666

AUSTRALIA: PROJECTS TO MATCH A GIANT LANDSCAPE,
Water and Waste Treatment, Vol 23, No 3, p 25-27, March, 1980. 7 Fig.

Descriptors: *Water management, *Australia, Resources management, Metropolitan water management, Outfalls, Dams, Flood control, Wastewater treatment, Water quality, Water supply development.

Water resources activity in Australia is currently moving from a major emphasis on development to an emphasis on management. Concern has increased over water quality levels. Works currently in the design and/or construction phase are concerned mainly with alleviating an existing major problem or working to initiate new development in a given region. For those of the latter type, increasing scrutiny and study are making ever-increasing demands on these new projects from environmental, social, and financial aspects. Individual projects are discussed. Dartmouth Dam on the upper Murray system has as its major purpose to augment other water supplies in New South Wales, Victoria and South Australia. The water quality of the Adelaide system, deficient in the areas of turbidity, color, taste and odor, is being studied. The Lower Molonglo Water Quality Control Centre is an advanced wastewater treatment plant designed to deal with long-term needs of Canberra. The Shoalhaven Scheme is designed to augment water storage for Sydney. The Thomson River project in Victoria is designed to supplement the water supplies for Melbourne metropolitan area. The Wivenhoe Dam on the Brisbane River will be a multipurpose storage facility with about a 2.5 million megaliter capacity. Flood mitigation in the urbanized areas of the lower Brisbane Valley is the second purpose for construction of the Wivenhoe Dam. The Burdekin River Project was established to reappraise the potential for the resources of the basin for agricultural, mining, industrial and urban development and for power generation. Efforts are also underway to deal with problems from Sydney's ocean outfalls and their adverse effects on the beaches. (Baker-FRC)
W81-05693

8B. Hydraulics

RE-EXAMINATION OF NIKURADSE ROUGHNESS DATA,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulic and Water Resources.
W. R. Brownlie.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY1, p 115-119. January, 1981. 2 Fig, 4 Tab.

Descriptors: *Flow resistance, *Roughness coefficient, *Friction, Nikuradse data, Fluid mechanics, Open channel flow, Pipes, Moody diagram.

Evaluation of friction factors for pipes and open channels commonly uses flow resistance data compiled by (1) the friction factor diagram by Moody, based on Colebrook and White, and (2) a diagram based on Nikuradse for sand roughened pipes. The Nikuradse data may be more applicable for problems involving open channels with uniform-sand beds for which a grain friction factor is required. However, the relative roughness and Reynolds number ranged are limited. This paper points out inconsistencies in roughness at Reynolds numbers less than 10,000 and provides a Moody-type diagram for a range of the data believed to be valid. (Cassar-FRC)
W81-05471

SURFACE TENSION EFFECT ON PROFILE OF A FREE VORTEX,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
N. Yildirim, and S. C. Jain.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY1, p 132-136. January, 1981. 3 Fig, 5 Ref.

Descriptors: *Surface tension, *Vortices, *Intakes, Model studies, Hydraulics, Fluid mechanics, Design criteria.

The effect of surface tension on the free vortex surface profile is significant at low circulation values, particularly near the core, according to an analytical examination. The effect of surface tension increases with decreasing circulation. This may give rise to some scale effects in model studies on vortex formation. This information may be useful in designing water intakes. (Cassar-FRC)
W81-05473

SOME NOTES ON MUSKINGUM METHOD OF FLOOD ROUTING,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
V. P. Singh, and R. C. McCann.
Journal of Hydrology, Vol 48, No 3/4, p 343-361, November, 1980. 6 Fig, 1 Tab, 33 Ref.

Descriptors: *Flood routing, *Mathematical models, *Hydrodynamics, Flow characteristics, Mathematical equations, Mathematical studies.

The Muskingum method for routing flood waves in rivers and channels has been a subject of numerous investigations since its development around 1934. Different investigators have assumed different initial conditions. The intial conditions and parameters must be appropriately specified if meaningful results are to be obtained for the method. Studies conducted by Gill are used to illustrate inconsistencies in the investigations already reported in the literature. The initial condition proposed by Gill is shown to be incompatible with the formulation of the Muskingum method. In addition, the assumptions made by Gill with respect to the inflow hydrograph are shown to be unrealistic. As a result, his calculations with regard to the translatory characteristics of the Muskingum method for given initial condition and parameter values are inaccurate. The following five methods were used to estimate the parameters 'k' and 'x' for three sets of data reported in the literature: graphical method, least-squares method, method of moments, method of cumulants, and direct optimization method. Evaluation of the five methods for estimating parameters to the three data sets indicated that all the methods are quite comparable. The five methods are all simple and easy to use, use more or less the same amount of information, and do not appear to have particular advantages over the other methods. (Carroll-FRC)
W81-05606

AN ENERGY REFERENCE LINE FOR DISSIPATIVE WATER WAVES ON A CURRENT,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
J. B. Christoffersen, and I. G. Jonsson.
Journal of Hydraulic Research, Vol 19, No 1, p 1-27, 1981. 9 Fig, 2 Tab, 16 Ref.

Descriptors: *Mathematical studies, *Fluid mechanics, *Water currents, Waves, Wave velocity, Energy, Energy gradient, Energy reference line, Mathematical equations, Energy equation.

The energy principle from steady hydraulics encompasses the concept of an energy or total head line and a horizontal energy reference line. The successful extension of this principle to a dissipative current wave motion over an arbitrary bottom is reported. The important new energy height equation, developed on the basis of the momentum and total energy conservation equations, states that the sum of a total current wave (energy) head and a current wave dissipation head is constant along a streamline. The total head is a sum of the following four terms: the mean water surface height above datum, plus a current velocity head, plus a mean wave velocity head, and minus an interaction term head. The current-wave dissipation head is a sum of a current dissipation head minus a wave dissipation head. The new equation permits calculation of wave heights in current depth refraction problems in a new way. Application of the equation to pure wave motion revealed some significant new results. The total head minus the wave dissipation head was found to be constant along a wave orthogonal. Also, the total head was found to be constant along wave fronts, but variable from one wave front to another. These findings show that it is possible to find a horizontal energy reference level for a dissipative wave motion if the proper initial conditions are selected. (Carroll-FRC)
W81-05607

WEIR AND FLUME CALIBRATION BY PONDAGE DRAWDOWN,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
F. A. Johnson, and C. S. Green.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 106,

No HY11, p 1903-1913, November, 1980. 3 Tab, 5 Fig, 6 Ref.

Descriptors: *Pondage, *Weirs, *Drawdown, *Flumes, *Mathematical studies, Effective capacity, Water level, Selective withdrawal, Flow, Storage capacity, Theoretical analysis, Head flumes, Channels, Calibrations, Flow measurement, Comparison studies.

The application of pondage drawdown to five flow measuring devices is considered, and the use of rapidly-varying unsteady flow wave theory to improve accuracy in the technique is proposed. Pondage drawdown involves blocking an outlet, raising the upstream water level to create an initially higher head value, and calculating values of outflow for successive head values based on an analysis of the drawdown curve. The five devices, v-notched weir, compound weir, flat-v weir, flat base flume, and bed hump flume, were calibrated volumetrically and by pondage drawdown. Results from 100 tests on the five devices show differences between the two methods which were less than or equal to 4%. Results suggest that lower differences are associated with structures with a larger head range, structures which generate a small negative wave, and larger pond areas. (Titus-FRC)
W81-05621

8C. Hydraulic Machinery

FLOW INVESTIGATIONS IN TWO PUMPING PITS,

Singapore Univ. Dept. of Engineering.
G. K. Nathan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY1, p 127-132. January, 1981. 4 Fig, 5 Ref.

Descriptors: *Flow characteristics, *Pumping tests, Reynolds number, Hydraulic machinery, High flow, Vortices, Froude number, *Pumps, Intakes.

Two simple pumping pits are used to study the relationship between hydraulic problems and various dimensionless groupings and the Reynolds number effect on the determination of swirl angle and the axial velocity distribution in the pump intake. The hydraulic problems include surface and submerged vortices, air entrainment in the flow, and swirl and asymmetric flow in pump intakes. The dry dock pumping pit (DDP-pit) has one vertical axis and a mixed flow pump capacity of 1,800 liters per sec. The return activated sludge pumping pit (RASP-pit) has two identical vertical axes, axial flow pumps of capacity 400 liters per sec each, symmetrically placed. The swirl angle measurement is slightly affected by the variation of the Reynolds number. The critical Reynolds number of $500,000 gives satisfactory simulation of the velocity profiles at the pump intake. The model pump efficiency may be used as a parameter to determine the best modification quantitatively. At a flow rate corresponding to Froude simulation, surface circulation around the suction inlet(s) occurs in both pits. When the flow rate increases towards the equal-velocity simulation, dimples formed in the RASP-pit remained as weak vortices, while those in the DDP-pit became strong intermittent air entraining vortices. (Cassar-FRC)
W81-05472

DESIGN OF 90-MGD WASTEWATER RECLAMATION PLANT,

Bechtel Inc., San Francisco, CA. Dept. of Environmental Water Projects.
For primary bibliographic entry see Field 5D.
W81-05530

MULTIPORT SLEEVE VALVE DEVELOPMENT AND APPLICATION,

Water and Power Resources Service, Denver, CO.
P. H. Burgi, E. O. Green, and R. E. Thibault.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY1, p 95-111, January, 1981. 10 Fig, 1 Tab, 11 Ref.

Descriptors: *Hydraulic valves, *Flow regulators, Aqueducts, Pipelines, Flow control, Energy dissipation, Cavitation, Sleeve valves.

Laboratory tests of two 200-mm sleeve valves (multiport and Bailey Polyjet) showed that the horizontal multiport sleeve design was preferable for long aqueduct systems. This valve, developed in the laboratory, has an outer fixed cylinder containing regulating ports and an inner movable cylinder as the control sleeve. The multiport sleeve valve design can be varied to handle a wide variety of flow regulation situations. Advantages of this concept are: (1) flow and energy are rapidly dissipated upon leaving the valve, and (2) cavitation can be controlled to occur in the water surrounding the valve, preventing wear on the valve and energy dissipation structure. The Bailey Polyjet valve performed well in the pressure ranges suggested by the manufacturer. However, cavitation tests at a flow of 0.17 cu meters per sec produced damage to the ported sleeve at a critical opening of 10-15%. (Cassar-FRC)
W81-05620

BIOFILM GROWTH AND HYDRAULIC PERFORMANCE,

Central Electricity Generating Board, Stockport (England). Scientific Services Dept.
B. Butterworth.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY 5, p 629-631, May, 1981. 4 Fig.

Descriptors: *Fouling, *Head loss, *Hydroelectric plants, Hydraulics, Pressure head, Pipelines, Cleaning, Maintenance, Bioaccumulation.

Steady declines in maximum power output (to 10% deficit after 12 years) in the Rheidol hydroelectric station, Wales, were traced to buildup of a 4.5 mm thick deposit on the inside of the pipeline. This material was high in organic material, iron, and manganese. Cleaning the tunnel with high-pressure water jets recovered most of the deficit. However, the concrete lining, roughened by particle flake-off, caused a pressure head loss until reattachment of slime and abrasion by grit resmoothed the surface after 18 months. Optimal frequency of cleaning was determined to be 7-8 years. (Cassar-FRC)
W81-05642

THE APPLICATION OF FINE DRUM SCREENS ON SEWAGE OUTFALLS AND TREATMENT PLANTS,

Brackett (F.W.) and Co. Ltd, Essex (England).
P. F. Rowles.
Water Services, Vol 84, No 1012, p 371-372. June, 1980. 1 Fig.

Descriptors: *Screens, *Intakes, *Wastewater treatment facilities, Outfall sewers.

A patented, improved screening media for sewage plants uses a plastic plate with selected hole size and spacing to eliminate blinding, hairpinning, and bridging holes in the screen. This apparatus is also useful for intakes from the sea, rivers, and reservoirs for industry and power stations. Advantages of the unit are: (1) raking tines do not descend through the contaminated water, (2) working parts function on the clean side of the bar screen, (3) all debris is removed in the first raking motion, and (4) positive discharge is achieved. (Cassar-FRC)
W81-05674

8D. Soil Mechanics

LINE OF SEEPAGE IN EARTH DAMS ON INCLINED LEDGE,

Kentucky Univ., Lexington. Dept. of Civil Engineering.
Y. H. Huang.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT5, p 662-667. May, 1981. 4 Fig, 2 Ref.

Descriptors: *Earth dams, *Stability analysis, Mathematical studies, Mining engineering, Coal mining, Seepage lines, Seepage, Safety.

Simple charts were developed for determining the line of seepage in earth dams on inclined ledge. After the line of seepage is determined, its coordinates can be fed into a computer, and the safety factor of the dam obtained. The charts can be applied to a horizontal base as well as to a sloping base. The latter case is of particular significance, because in rugged terrain many earth dams are constructed on an inclined ledge. Since the promulgation of the Surface Mining Control and Reclamation Act of 1977, it is necessary to determine the safety factor of every coal refuse dam. These dams are mostly constructed on an inclined ledge with no internal drainage provided. It is hoped that this method will prove helpful for the stability analysis of these dams. (Baker-FRC)
W81-05475

ROUGHNESS-SHEAR STRENGTH RELATIONSHIP,

Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
R. Peek.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT5, p 672-677. May, 1981. 3 Fig, 2 Ref.

Descriptors: *Roughness coefficient, *Rocks, Strength, Shear stress, Abrasion, Stress, Traction, Shear tests.

A method of describing the roughness of joint surfaces has been developed, which samples an area as a whole, leading to a roughness function which is specific to a given direction of shear. The roughness data thus acquired may be used in a rational model to estimate shear strength. Although a correction factor must be introduced to allow for progressive failure of asperities and loss of interlock, this correction factor has a physical meaning, and estimates of shear strength are not sensitive to the value of this correction factor. The results of direct shear tests on plaster replicas of the same joint surface show good agreement between measured and predicted shear strengths at different normal loads if a suitable value for r is chosen. If further experiments demonstrate that r remains constant for a larger range of normal stresses and a variety of joint surface geometries, its value will have been determined once for all times. (Baker-FRC)
W81-05476

PREDICTION OF SWELLING POTENTIAL FOR NATURAL SOILS,

National Soil Services, Inv., Houston, TX. Dept. of Geotechnical Engineering.
S. S. Bandyopadhyay.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT5, p 658-661. May, 1981. 1 Tab, 2 Ref.

Descriptors: *Soil properties, *Foundation failure, Soil stability, Soil creep, Soil engineering, Soil types, Dams, Dam failure, Highways, Design criteria, Earth dams, Earthworks, Embankments, Roadbanks.

Using test data from 259 naturally occurring soils obtained from 22 counties in Kansas, a well-defined relationship was established between the percentage of clay sizes present in a soil, the activity of the soil, and the percentage of swell under a 1-psi surcharge of a sample compacted to 92% of standard AASHO density at optimum moisture content. Excellent agreement was found between the predicted swelling and the actual swelling. The average error in predicting the swelling potential for the 26 soils was found to be 6.9%. The prediction equations will serve as a valuable tool in the design of any structure on compacted soils. (Baker-FRC)
W81-05477

Group 8D—Soil Mechanics

OPTIMAL ESTIMATORS FOR SOIL PROPERTIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
G. B. Baecher.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT5, p 649-653, May, 1981. 2 Fig, 3 Ref.

Descriptors: *Soil properties, *Mathematical studies, Estimating equations, Estimating, Soil engineering, Soil profiles, Soil horizons, Profiles.

A simple procedure is proposed for reducing the variance of estimators of equivalent parameters, which can be difficult to manage when attempting to estimate the properties of assumedly homogeneous zones or strata of a soil profile for use in modeling. The procedure proposed uses a weighted combination of soil measurements. The weights for these weighted sums reflect both the redundancy of information in closely spaced observations and the differing influence of regions of the soil profile due to nonuniformly imposed loads. Simple statistical methods such as this one provide a vehicle for improving the manner in which geotechnical analyses are now performed. They do so at little additional cost, and without introducing elaborate reliability models. However, the major limitation to the accuracy of geotechnical predictions still remains the geomechanical model and the geologic assumptions on which it is based. (Baker-FRC)
W81-05500

CONSTRUCTION VIBRATIONS: STATE-OF-THE-ART,
Wiss, Janney, Elstner and Associates, Inc., Northbrook, IL.
J. F. Wiss.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT2, p 167-181, February, 1981. 10 Fig, 2 Tab, 32 Ref.

Descriptors: *Construction methods, *Vibrations, *Underground structures, Construction, Construction equipment, Strain, Pipelines, Water mains, Sewers.

The sources of construction vibrations, the transmitting medium, and the effects upon the receivers of the vibrations are discussed. Transient or impact vibrations are caused by explosives, demolition, etc. Steady-state or continuous vibrations are caused by vibratory pile drivers and large pumps, while pseudo-steady vibrations are caused by jackhammers, bulldozers, cranes, etc. The magnitude of the vibration is a function of the energy at the source. These vibrations are important because of their potential to cause complaints or damage to structures or building contents. Suggested criteria for limiting vibrations are presented, including information on residential structures, commercial buildings, new concrete, old concrete, and soils. Cohesive soils seem to be the least affected (compacted), while cohesionless soils are sensitive to vibration. The effects of vibrations on underground utilities are not known, and research is needed to quantify this important aspect. Sewer and water mains have withstood vibrations with peak partial velocities of three inches per second without damage. (Small-FRC)
W81-05582

AT-REST LATERAL PRESSURE OF PEAT SOILS,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
T. B. Edil, and A. W. Dhowian.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT2, p 201-217, February, 1981. 8 Fig, 3 Tab, 16 Ref.

Descriptors: *Peat soils, *Peat, *Soil pressure, Construction, Organic soils, Foundation failure, Wetlands, Peat bogs.

The coefficient of lateral earth pressure under conditions of no lateral deformation (K) was determined for peat soils. Peat is a fragmented organic material derived from vegetation which has been chemically changed and fossilized. It is formed in wetlands, and thus, is the foundation for structures built in peat areas. Peat samples with fiber contents ranging from 20 to 60% were tested. Significant difference was observed between the K values of peats and clays, with the K value of peats beginning much lower in the presence of fibers. Peat type also exerted significant influence on the measured value of K during loading. It was 0.53 for amorphous granular peat and about 0.30 for fibrous peats. The relationship between the horizontal and vertical effective stresses during unloading in nonlinear, so the value of K is not constant. The effective friction angle of peats is much higher than that for inorganic soils, and the use of classical soil mechanics strenth theory to explain the behavior of peats is limited due to the presence of fibers. Peats can be classified as fibrous or amorphous for engineering purposes. (Small-FRC)
W81-05583

COMPUTER SIMULATION OF CREEP OF CLAY,
Luleaa Univ. (Sweden). Div. of Soil Mechanics.
R. Pusch, and P. Feltham.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 107, No GT1, p 95-104, January, 1981. 6 Fig, 5 Ref.

Descriptors: *Soil creep, *Clays, *Simulation, Computer models, Deformation, Mathematical studies, Foundation failure, Structural engineering.

An improved physical creep model and its mathematical analogy are presented for creep of clay under undrained conditions. The creep rate is examined according to the model by means of computer simulation. The form of the creep curve was determined at constant stress and temperature. The dependence of the strain on time was found to be approximately logarithmic and was in good agreement with experimental results. Clay creep is important for the time-dependent settlement of foundations on overconsolidated clay and for depth creep in slopes excavated in low-permeability, homogeneous clay strata. The use of various boundary conditions, particularly those defining the barrier spectrum at the onset of creep, will facilitate the use of the computer model in studies on the deformation of clays. (Small-FRC)
W81-05585

8E. Rock Mechanics and Geology

ROUGHNESS-SHEAR STRENGTH RELATIONSHIP,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W81-05476

8G. Materials

SPECIFICATIONS, MECHANISMS AND SYSTEMS FOR HIGH PERFORMANCE SPECIALIZED COATINGS,
Long Products Limited. Rye (England). Special Coatings Div.
D. Pye.
Water Services, Vol 85, No 1020, p 83-84, 87, February, 1981. 2 Ref.

Descriptors: *Coatings, *Wastewater facilities, Linings, Construction materials, Planning, Construction, Bacteria, Hydrogen sulfide, Organic acids, Acids.

Various aspects which must be taken into consideration while drawing up specifications for protective coating systems are discussed so that premature failure of the coating system will not occur. The most important part of any steel coating contract is the correct preparation of the surface and surface profile. After initial dry abrasive blast cleaning of the surface of steel it may appear to have acceptable cleanliness. However, rust or black colored patches can develop in a short period of time, due to rust-producing soluble iron salts. The use of water-entrained abrasive blast cleaning incorporating suitable inhibitors can overcome the soluble salt problem, but problems of 'pooling' can result. The shape and depth of profile also plays a major part in the success of a coating system. The use of cathodic protection, rust inhibiting coatings, or barrier coatings may be desirable. Due to the aqueous system involved in sewage treatment plants, together with the production of hydrogen sulfide gas, organic acids from bacterial decomposition, aeration of fluids, and grit entrainment in fast moving liquids, steel and concrete components can benefit from adequate protection with high performance specialized coatings. (Baker-FRC)
W81-05662

SEWER CUTS EMPHASIZE MAINTENANCE NEEDS,
D. F. Rees.
Water Services, Vol 84, No 1007, p 55-56, 58, January, 1980.

Descriptors: *Sewer systems, *Maintenance, *Economic efficiency, Water mains, Economic aspects, *United Kingdom, Concrete, Resins.

Despite economic cutbacks in the United Kingdom, more must be done to inspect, repair, and renovate the nation's sewer systems. The objective of renewal is to minimize expensive programs of capital replacement. Closed circuit television (TV) can be used to inspect sewers, and the data obtained can be used to prioritize maintenance work. Routine maintenance, which includes the removal of slime and silt and treatment of tree roots and illegal connections, is more efficient with TV survey information. Methods of sewer renewal include sprayed reinforced gunite, spun motor lining methods, preshot reinforced gunite, thin shells of glass reinforced concrete with lapped or rivetted joints, and the use of polymer-concrete formulations. Slip lining, popular in North America, is not used widely in Britain. A new process employs a resin-saturated needlefelt sock which is inverted within the sewer by the application of a pressure head of water. After inversion, the water temperature is raised to set the resin. Many of Britain's water mains are old and will need renovation or replacement if a clean water supply is to be maintained. (Small-FRC)
W81-05663

FLOOD PREVENTION IN SIDCUP.
For primary bibliographic entry see Field 2E.
W81-05665

QUALITY ASSURANCE - GETTING VALUE FOR YOUR MONEY,
For primary bibliographic entry see Field 8A.
W81-05666

DEVELOPMENTS IN MATERIALS AND METHODS,
R. G. H. Boyes.
Water Services, Vol 84, No 1010, p 228-229. April, 1980. 10 Ref.

Descriptors: *Textiles, *Clays, *Construction materials, Bentonite, Barriers, Landfills, Leachates, Sealants, Water industries, *Materials engineering.

A new generation of materials for the construction and water industries has now been in use long enough for realistic evaluation. Two examples are synthetic textile fibers (replacing bituminized fibers) and modified clays and bentonites (used for waste containment). Synthetic fibers are used successfully in subsurface drains to form a barrier between soil particles and large stone aggregates. Fabrics, made of polypropylene, polyester, polyamide (nylon), polyethylene, polyvinylidene chloride, and combinations of these, are classed in 4 categories according to properties: separation between soil of different characteristics, hydraulic

filter use (light or severe), stress or load spread, and special purpose fabrics. Clays have been useful in removing or inactivating toxic chemicals and metals from leachates and in confining groundwater flow where desired. (Cassar-FRC)
W81-05671

CORROSION PROTECTION OF METALS,
A. Heath.
Water Services, Vol 84, No 1011, p 288-290. May, 1980.

Descriptors: *Protective coatings, *Corrosion control, *Chemical treatment, Coatings, Storage tanks, Metals, Tanks, Water treatment facilities, Hoar Report, Maintenance costs, Costs, Cleaning.

The 1971 Hoar Report estimated that corrosion cost the United Kingdom 1400 million pounds annually, with about 25 million pounds being borne by the water industry. These figures in 1980 terms are 3500 million and 63 million pounds, respectively, with a 10 million pound savings possible each year. Chemical immersion is one method of treating ferrous metal surfaces. It is rapid, efficient, and easily used on complex structures with hidden inner surfaces and lattice work. After chemical or mechanical cleaning and rinsing, the structure is immersed in hot phosphoric acid based solution, which forms a film of amorphous iron phosphate. A thin protective oil film is applied by immersing in dewatering oil. The structure can then be stored until final fabrication. Treatment prior to erection saves money and ensures a complete coating. A case study of cleaning, pretreatment, and coating the interior of methane tanks and other equipment at the Severn-Trent Water Reclamation Center is presented. (Cassar-FRC)
W81-05672

FLEXIBLE GLASS STORAGE.
Water Services, Vol 84, No 1010, p 242, 247, April, 1980.

Descriptors: *Storage tanks, *Coatings, *Corrosion control, Glass, Water treatment facilities, Wastewater treatment facilities, Installation, Maintenance, Water storage.

Steel storage tanks coated on both sides with borosilicate glass (Permaglas) have found wide use in water and sewage treatment plants. The tanks provide a flexible, standardized storage system. The highly corrosion resistant tanks are virtually maintenance-free and are easily installed and dismantled to provide temporary or emergency storage. Other uses are potable water tanks, irrigation water tanks, chlorination contact tanks, sludge holding tanks and storage of industrial wastewater and effluents. (Cassar-FRC)
W81-05677

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

UN WATER CONFERENCE: SCOPE FOR TRANSFER OF KNOWLEDGE IN ITS ACTION PLAN,
United Nations, New York. Dept. of International Economic and Social Affairs.
For primary bibliographic entry see Field 6F.
W81-05653

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

CONVERSATIONAL WATER QUALITY DATA RETRIEVAL SYSTEM,
Corps of Engineers, Portland, OR.
D. W. Larson, and T. Bingham.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 107, No WR1, p 239-243, March, 1981. 1 Fig, 1 Tab, 5 Ref.

Descriptors: *Information retrieval, *Computers, *Data storage and retrieval, FORTRAN, Information systems, Water quality, Planning.

A data base management system SIR (Scientific Information Retrieval) and a FORTRAN program are used to simplify retrieval of computer-stored information on physical, chemical, and biological data for reservoirs and rivers in western Oregon. Little or no computer experience is needed to communicate with the system, which uses conversational language and built-in operating commands to guide the user. At any stage, a 'menu,' or list of possible responses to questions, is available. The system can be used to store and retrieve any kind of data. It can produce data tabulations, graphics, and statistical plots and analyses for research. (Cassar-FRC)
W81-05539

10C. Secondary Publication And Distribution

SELECTIVE ANNOTATED BIBLIOGRAPHY OF GEOLOGY AND GROUNDWATER RESOURCES FOR THE MONTANA PART OF THE NORTHERN GREAT PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS,
Geological Survey, Helena, MT. Water Resources Div.
J. F. Levings, G. W. Levings, R. D. Feltis, W. R. Hotchkiss, and R. W. Lee.
Availabe from the OFSS, USGS Box 25425, Fed, Ctr., Denver, CO 80225, Price: $13.75 in paper copy, $4.00 in microfiche. Geological Survey Open-File Report 81-401 (WRI), May, 1981. 91 p, 1 Tab.

Descriptors: *Bibliographies, *Hydrology, *Geology, *Water quality, Water use, Water demand, Publications, *Montana, Northern Great Plains.

Increasing demand for water to meet needs for energy, industry, irrigation, domestic, and municipal uses has resulted in a study of the geology and hydrology of rocks of Mesozoic and Cenozoic age. This report presents the results of a literature search for the part of the study area in Montana. It consists of an annotated listing of pertinent published reports, a partial subject and area index of the reports, and a correlation chart of geologic and aquifer units listed in the annotations. (USGS)
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